Railway Engineering and Maintenance

A COLORFUL SUCCESS
because of its practical design
and general acceptance

THE P. & M. CO.

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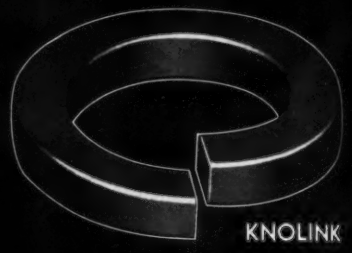
WASHINGTON • ST. PAUL • BOSTON

Reliance HY-CROME Spring Washers

★ Manufacturing methods in our most modern and completely equipped fabricating plant and wire mill are controlled by our own modern chemical and physical laboratory, where every precaution is used in checking to our own specifications the material received from the hot mill, and also every step in production procedure, making our control of quality of the finished product as complete as possible. The Reliance Spring Washers shown are made from carbon steel of our own specification under the same carefully supervised production methods used on the HY-CROME Family — Scientifically made products from start to finish.

KANTLINK

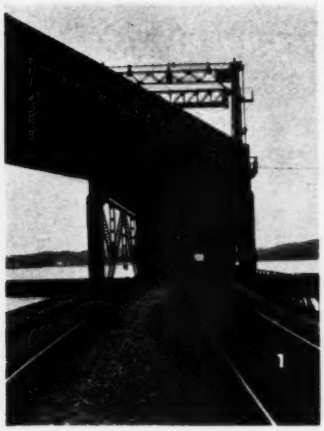

KNOLINK

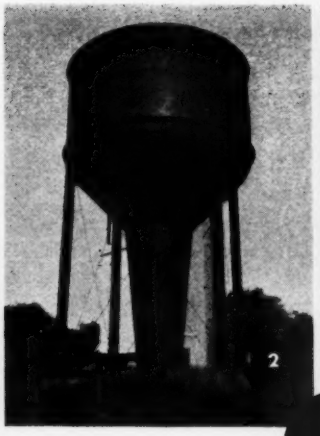
POSITIVE

RIB PATTERN

EATON MANUFACTURING CO. RELIANCE SPRING WASHER DIVISION, MASSILLON, OH

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal





1—SIGNAL BRIDGES, turntables, track scales, overhead cranes, electrification poles, messenger wire, cables and clips, and even sheet steel buildings can be protected against rust with NO-OX-ID.

2—WATER STORAGE TANKS and standpipes together with the piping, zeolite and lime soda treating tanks, wash-out tanks, and steel hoops on wooden tanks last many times longer when protected with NO-OX-ID.

3—RAIL JOINTS. NO-OX-ID not only prevents rust and freezing of rail joints, but it also acts as a lubricant. May be used on switch and circuit control rods, battery boxes, threads of turnbuckles, bolts, nuts, etc.

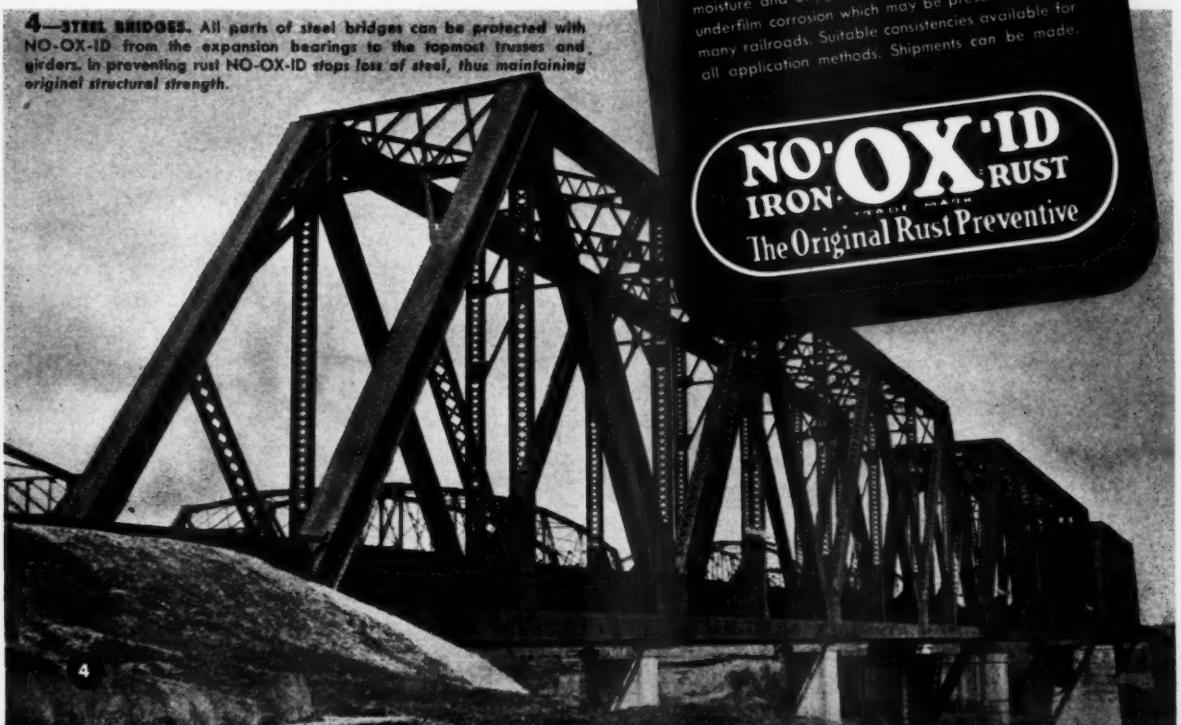
The first step in

STEEL CONSERVATION

Arm your paint crews with NO-OX-ID Rust Preventive and instruct them to coat all metal surfaces of structures where corrosion is active. NO-OX-ID prevents rust two ways; mechanically by excluding moisture and oxygen, and chemically by inhibiting underfilm corrosion which may be present. Used by many railroads. Suitable consistencies available for all application methods. Shipments can be made.

NO·OX·ID
IRON RUST
TRADE MARK
The Original Rust Preventive

4—STEEL BRIDGES. All parts of steel bridges can be protected with NO-OX-ID from the expansion bearings to the topmost trusses and girders. In preventing rust NO-OX-ID stops loss of steel, thus maintaining original structural strength.



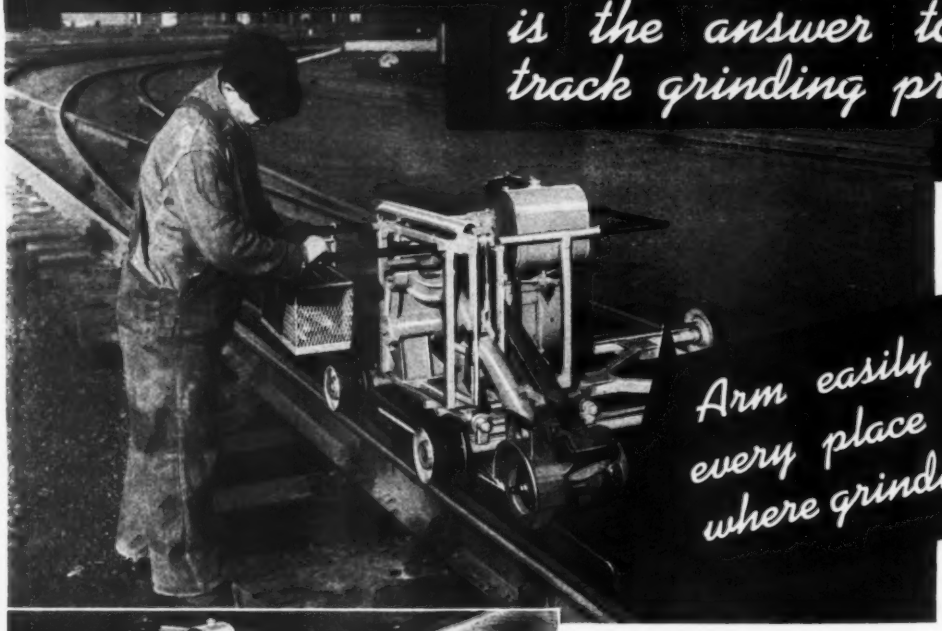
Dearborn CHEMICAL COMPANY
TRADE MARK REGISTERED

DEPT. U, 310 S. MICHIGAN AVE., CHICAGO
NEW YORK • LOS ANGELES • TORONTO

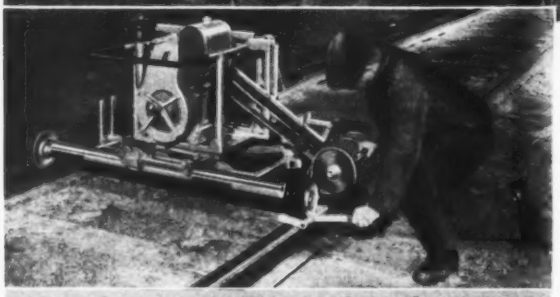
Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

This FLEXIBLE ARM GRINDER

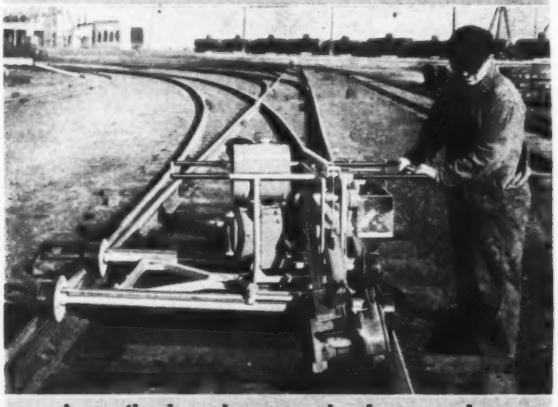
is the answer to your track grinding problems



Arm easily reaches every place on track where grinding is done



Arm swung crosswise for rail end slotting with thin wheel.



Arm tilted so that cupwheel can undercut stock rail to house switchpoint.

Removing flow at switchpoint with double faced cupwheel.

For SPEED and CONVENIENCE, no grinder used for track maintenance can approach the performance of this Flexible Arm Grinder, a recent development of Nordberg. This unusual grinder is the result of many years experience in designing machines to do track work better, faster and at less expense. Here are some of the jobs it will do:

- Remove flow at switchpoints and stock rails.
- Undercut stock rails to house switchpoints.
- Grind frogs and flangeways.
- Groove rail at turnouts.
- Slot rail ends.

See this grinder in our exhibit at the Railway Appliances Exposition, Palmer House, Chicago, March 16-19. Write for bulletin.

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

Timken Bearing Equipped section motor cars and trailers enable maintenance crews and material to be transported in minimum time wherever they may be needed.

Within the limits of their capacity, their performance is comparable with that of modern main line locomotives, cars and streamlined trains—in speed, endurance and dependability.

As far as the upkeep of the cars themselves is concerned, this is greatly reduced, for Timken Bearings require very little lubricating or other maintenance attention.

The new section cars you buy now—if Timken Bearing Equipped—will serve the needs of the moment and the future with equally satisfactory results.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

A

Low Cost Protection

against

RAIL END-BATTER

OLIVER TRACK BOLTS

WHY risk rail end-batter . . . high track maintenance cost and more frequent rail replacements when OLIVER Track Bolts give so much security at so little cost?

OLIVER Track Bolts are designed to meet the heaviest requirements of track men . . . plenty of *extra* toughness to pull-up *tight* and easily resist the shear and tension caused by heavy, fast-moving traffic . . . a well-formed oval neck that really fits the joint bar . . . and accurate threads that "take" the nut fast and take the punishment too.

Tight rail joints stop the causes of rail end-batter. Specify OLIVER Track Bolts . . . the low cost way to *secure* tight joints. *Your* maintenance and construction requirements are being given special attention . . . yours may be the road to Victory.

Other **OLIVER PRODUCTS for the RAILROAD INDUSTRY**

- ★ Screw Spikes
- ★ Gage Rods
- ★ Structural Bolts
- ★ Frog Bolts
- ★ Switch Bolts
- ★ Connecting Rod Bolts
- ★ Car Builders Specialties

OLIVER

IRON AND STEEL

Corporation

SOUTH TENTH AND MURIEL STREETS, PITTSBURGH, PA.

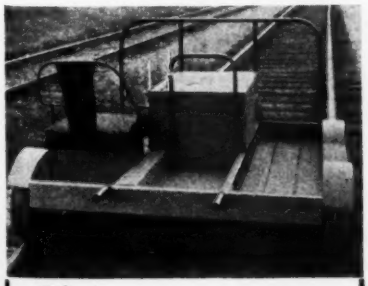
Off the Track in 10 seconds with the BUDA "Buddy"

-ON AGAIN in 27 seconds!

And most railroad men can do better than that! . . . There are reasons why it is possible to do this with the Buda "Buddy" Model F-1 car:

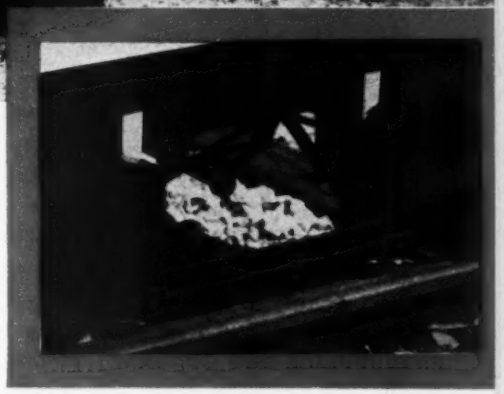
- *Light-weight All Steel Frame.*
- *Rear Lift of Only 95 lbs.*
- *Patented Rail Skids.*
- *Engineered Design with Weight Properly Distributed.*

This quick-removal feature is just one of the many safety features of the Buda "Buddy", and why it has become so popular with Inspectors, Signalmen and Roadmasters — and its economy features make it a favorite with their bosses.



Why be satisfied with out-dated, uncomfortable motor cars? Get a Buda "Buddy" for your working companion. Write for complete literature today, which shows its many advantages.

***Also**—if you need a larger, heavier motor car that will carry up to four men, investigate the Buda "Roadmaster". (Model F-2 Roadmaster or small gang car, illustrated above).*



Here's a close-up view of the rail skids on the Buda "Buddy" Model F-1, one or two-man inspection car. Note the sturdy construction of the steel skid (patented), mounted between wheels, only 1 inch above the rail.

BUDA
ESTABLISHED
1881

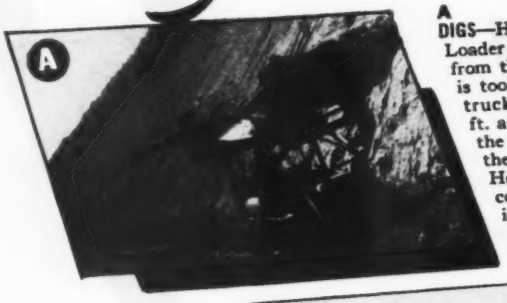
Get a SAFER BETTER Ride with BUDA

THE BUDA CO.
HARVEY (Chicago Suburb) ILLINOIS

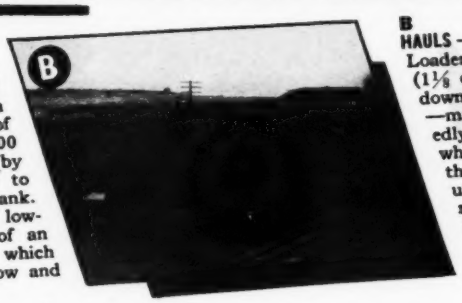
ATHEY MOBILOADER

Cleans Ditch AND *Cuts Bank*

in SIMPLE, LOW COST, "TRACK FREE" STEPS



A
DIGS—Here the Mobi-Loader digs material from the ditch which is too soft for use of trucks. Every 1000 ft. a ramp is built (by the MobiLoader) to the top of the bank. Here's fast and low-cost handling of an important job which used to be slow and costly.



B
HAULS — The Mobi-Loader hauls its load (1⅛ cu. yd. bucket) down the right-of-way —marches surefoot-edly up the ramp— while train service on the route continues unaffected. There's no need for constant interruption of work experienced with rail-bound equipment.

C
DUMPS—Top of the bank, far enough back so it can't wash down the cut, the material is dumped. After this work is completed the versatile unit is available to load gravel, move stockpiles, clear snow from busy yards, tear up ties, repair wash-outs, and do scores of tasks.

To say that the Athey MobiLoader proved itself a money-saver for this Western railroad is putting it mildly

For it took over a man-sized ditch cleaning job that usually required expensive work train equipment—and simplified the entire operation.

Without a moment's interruption to traffic, the MobiLoader restored the ditch and sloped the bank along a 4600 foot cut, doing its own digging, hauling and dumping. It dug excess soil which had washed into the ditch, hauled its load down the right-of-way, climbed the bank and dumped the material on top the cut. Many of the hauls were up to 1000 feet. More than 15,000 cubic yards of material was excavated.

Thus, this handy off-track equipment made a real saving in cost-per-yard moved, in time, initial investment, with no disruption of train traffic. And this job is only one of many the MobiLoader can do for railroads! For full details write Athey Truss Wheel Co., 5631 W. 65th Street, Chicago, Illinois.

ATHEY

CURVE RAIL PROTECTION IS A WAR-TIME "MUST"

Each Meco Lubricator Protects a Number of Curves

Every railroad man knows that curves are the most hazardous parts of the track—that curve rails wear out fast if not protected against the effect of tremendous side thrust and excessive flange wear of passing wheels. Curves, therefore, receive preferred attention, including daily inspection.

Today, railroads have a choice of two methods of maintaining curves safely for train operation.

FIRST: To regauge and respike rails constantly, to keep renewing spike-killed ties, and to replace the rails in curves at frequent periods (if you can get new rails).

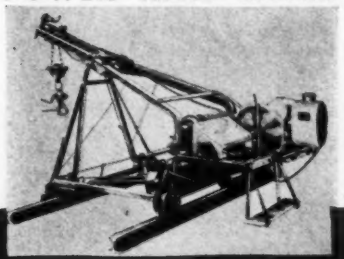
SECOND: To give curves adequate flange lubrication, that minimizing flange wear on rails—and make curve rails last as long as tangent rails.

MECO *Rail & Flange Lubricators*

1. Minimize curve rail wear otherwise caused by wheel flange friction.
2. Make curve rails last as long as tangent rails.
3. Reduce derailment hazards by decreasing curve friction.
4. Eliminate or reduce regauging and realigning of curves.
5. Greatly reduce respiking of ties on curves, and continual replacement of spike-killed ties.
6. Prevent possibility of train delays due to curve regauging or rail replacement work.
7. Make higher train speeds possible, with safety.
8. Speed up slow trains, thus decreasing "flow" of low rail.
9. Reduce wheel flange wear, particularly noticeable on locomotive wheels.
10. Permit increased tonnage ratings through divisions where curvature governs such ratings.
11. Reduce fuel consumption.
12. Frequently do away with helper service.

Let us Analyze Your Curve Territory Charts and Suggest Economical Lubrication

POWER RAIL LAYER



Requires no train orders.

MACK SWITCH POINT PROTECTORS

Make switch rails last 4 to 10 times longer.

See Our Exhibit at Booth No. 89, N. R. A. A. Exhibit

MAINTENANCE EQUIPMENT COMPANY

RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS

SAVE STEEL

PROLONG RAIL LIFE

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Reform Your Present Joint Bars

When Possible

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Use Our Specially Designed

New Joints for Worn Rail

—

WE WILL GLADLY MAKE A STUDY OF YOUR CONDITIONS

—

THE RAIL JOINT COMPANY INC.

50 CHURCH STREET NEW YORK, N. Y.

F-M *Sheffield* AND *Eclipse*

Here are four of the most important days in all the year for Railroad Officials—March 16 to 19th. Plan now to attend the 31st Annual Exhibit . . . .

This Exhibit is more vital now than ever before. Like other industries, Railroads are speeding up and spreading out their improvement programs, bringing you face to face with urgent problems which improved or new products can solve.

You'll find help in solving many of these problems at this great Exhibit, all under one roof—where you can see and investigate new and time-saving appliances and equipment—see demonstrations—"swipe" ideas.

Make arrangements now to be there yourself and have other men in your Department attend.

IN CONNECTION WITH THE AMERICAN RAILWAY ENGINEERING ASSOCIATION CONVENTION

THE NATIONAL RAILWAY APPLIANCES ASSOCIATION

208 SOUTH LA SALLE STREET **CHICAGO, ILLINOIS**

MOTOR CARS *A Complete Line . . . Sizes and Types for Every Need*

INSPECTION CARS

WATER-COOLED • AIR-COOLED

CHAIN DRIVE • BELT DRIVE

NEW—Eclipse Model 757. Hailed by experienced operators as the last word in one-man cars. Water-cooled 9-hp. engine. 30 m.p.h. normal speed. Easy, quiet ride assured by rubber cushioning between wheels and frame, and by wood-center wheels. Rear end lifting weight, only 90 lbs. Belt drive; soon to be available in the Sheffield line with clutch and chain drive. Write for Bulletin ARB 870.1.

Sheffield Model 54. For one to four men, yet one man can handle it. Rear end lifting weight only 100 pounds. Water-cooled 5- to 8-hp. engine. Chain drive. Ask for Bulletin ARB 760.1.
Sheffield Model 84. Similar to 54 except air-cooled.
Eclipse Model 754. Similar to 54 except belt-driven. Described in Bulletin ARB 770.1.
Eclipse Model 784. Similar to 54 except air-cooled and belt-driven.

Why F-M Cars Are *STILL FIRST*

It isn't simply because they were *first on the rails* that F-M Sheffield and Eclipse Motor Cars are *still first* in railroad men's regard. It is because the organization which builds them has made the major contributions to the efficiency and safety of motor cars, push cars, and trailers.

F-M Cars are first, too, because they have the sound, practical design which results from constant research and exhaustive track tests . . . the sturdy, precise construction which rises from unequaled manufacturing facilities . . . the long life, low maintenance cost, and real interchangeability of parts which come from high standards of materials and workmanship.

All Sheffield Cars have *chain drive,* usually preferred where cars must operate in deep snow and high water. The Sheffield clutch is the one you can't burn out in operation.

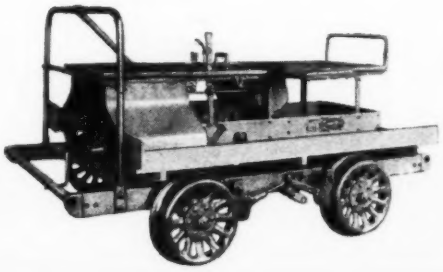
Eclipse cars have belt drive. In other respects the Eclipse line closely parallels the Sheffield line.

★ ★ ★

Instruction books and parts lists on any Fairbanks-Morse railroad equipment will gladly be sent on request.

EXTRA GANG and B&B CAR

Sheffield Model 40B. Two-cylinder, air-cooled engine permits full-load operation for hours without overheating. Develops exceptionally high torque at low speeds. Friction transmission. Chain drive. Steel frame. Write for Bulletin 7115.



FAIRBANKS, MORSE & CO.

600 SOUTH MICHIGAN AVENUE, CHICAGO, ILLINOIS

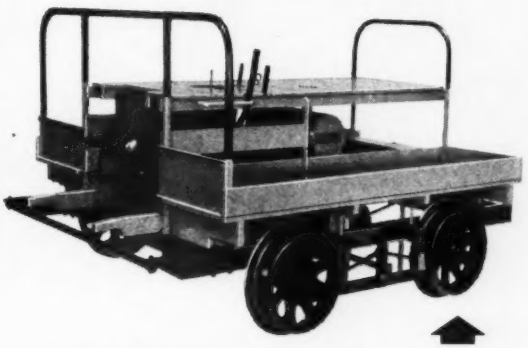
First on the Rails and *STILL FIRST!*

SECTION CARS

7 MODELS • WATER-COOLED • AIR-COOLED
CHAIN DRIVE • BELT DRIVE

Sheffield Model 85. Lightweight, full-sized section car, weight 700 pounds. Has alloy steel frame, safety tread metal toe boards, pipe safety rails, side outlet exhaust, self-centering brakes with cast-iron faced brake shoes, removable seat top. Rear lifting weight only 101 pounds. Air-cooled 8-hp. engine, chain drive. Described in Bulletin ARL 820.1.

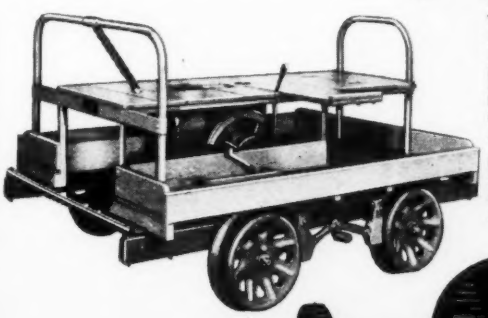
Eclipse Model 785. Similar to 85, but belt-driven.



Sheffield Model 58. A lightweight section car for a six-man gang and their tools. Weight, only 840 pounds. Rear end lift, only 117 pounds. Water-cooled 5- to 8-hp. engine. Chain drive. Send for Bulletin ARB 700.10.

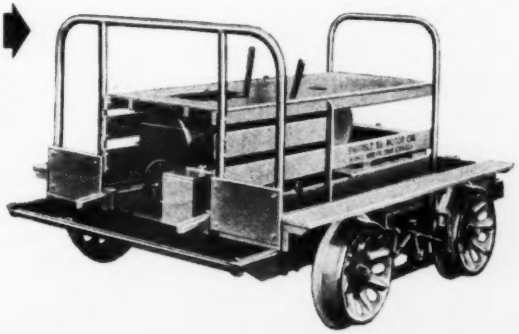
Eclipse Model 758. Similar to 58, but belt-driven.

Sheffield Model 448. The standard section car on many class 1 railroads. Sturdy, roomy. Weighs 1095 pounds. Has ample power to haul trailers loaded with men and tools or ties. Water-cooled 8- to 13-hp. engine with air-cooled head. Chain drive. Send for Bulletin ARB 230.1.



Sheffield Model 53. Weighs only 929 pounds, with rear end lift of only 124 pounds. Has 8- to 13-hp. water-cooled engine with air-cooled head. Chain drive. Space for full section gang and tools. Ask for Bulletin ARB 700.1.

Eclipse Model 709. Similar to 53 but belt-driven. See Bulletin ARB 750.1.



TIMKEN BEARING EQUIPPED

F-M

RAILROAD SALES OFFICES: NEW YORK • CHICAGO • ST. LOUIS • ST. PAUL CINCINNATI • ATLANTA • NEW ORLEANS • SAN FRANCISCO

Export Division: 80 Broad Street, New York City

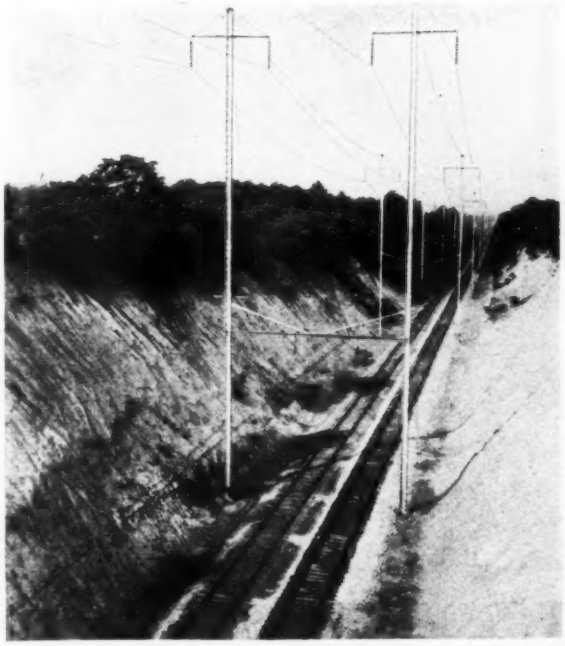
Canada: Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Winnipeg

HOW TO "REFORM" TROUBLE-MAKING ROADBEDS

This roadbed *used to be* a "trouble-maker." Groundwater saturated the subgrade and caused excessive maintenance. Surface repairs were only temporary and had to be repeated time after time.

But the railroad had a ready answer. ARMCO Perforated Pipe was installed to intercept and remove groundwater. Today, thanks to a firm, dry subgrade, the roadbed has "reformed" and costs far less to keep firm and safe. Moreover it will stay that way. An ARMCO subdrainage system resists crushing and disjointing. Flexible, corrugated metal design and strong, tight joints see to that. There is no need to worry about heavy loads, traffic vibration, shifting soils or severe frost action.

ARMCO Perforated Pipe is easy to lay in any season. Regular crews do the work without special tools. Long lengths are quickly joined by sturdy band couplings to form a strong, trouble-free conduit. Cost is low and the job soon pays for itself. Write for the facts. Armco Railroad Sales Co. Inc., 721 Curtis St., Middletown, Ohio.



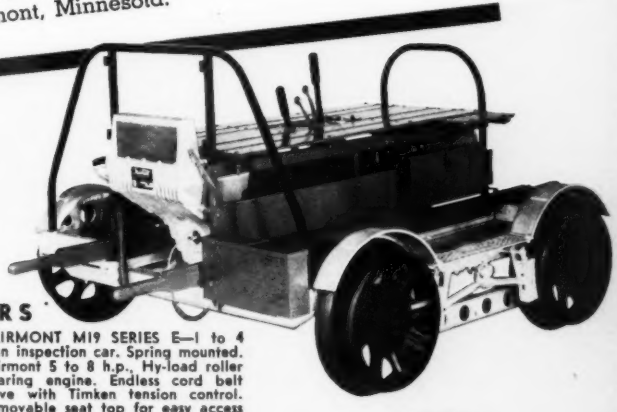
ARMCO PERFORATED PIPE

YES . . .

MAKES THE CAR YOU NEED FOR LOW-COST ROAD MAINTENANCE

Fairmont

It is easy to choose the right equipment when you make your selection from the world's most complete line of railway motor cars. There is a model and size for every hauling requirement. Fairmont offers you a choice of ball-bearing or roller-bearing engines in inspection and section cars, and 4-cylinder and 8-cylinder engines in gang cars. Fairmont's policies of changing for improvement only and of standardizing fundamental dimensions of major parts, to insure ready interchangeability, assure substantial economies in keeping your equipment up-to-date. They minimize obsolescence and reduce stocks of repair parts. See Fairmont equipment! Talk to Fairmont users! You'll then understand why, of all the cars in service today, more than half are Fairmonts. Fairmont Railway Motors, Inc., Fairmont, Minnesota.



INSPECTION CARS

FAIRMONT M9 SERIES D—1 to 2 men 500-lb. load capacity. Rear lift 95 lbs. Four-wheel brakes. Extension lift handles. Fairmont RO Hy-load roller bearing 5 to 8 h.p. engine.

FAIRMONT M19 SERIES E—1 to 4 man inspection car. Spring mounted. Fairmont 5 to 8 h.p., Hy-load roller bearing engine. Endless cord belt drive with Timken tension control. Removable seat top for easy access to engine.

SECTION CARS

FAIRMONT M14 SERIES G—2 to 6 man light section car. Suitable for full size section gangs or for use by only 2 men. Rear lift using extension lift handles is only 105 lbs.

FAIRMONT S2 SERIES G—2 to 10 man heavy duty section car. Powered by Fairmont, RO Hy-Load roller bearing engine 8 to 13 h.p., this ruggedly built, roomy car can tow one to two loaded trailers up grades with maximum economy.

GANG CARS

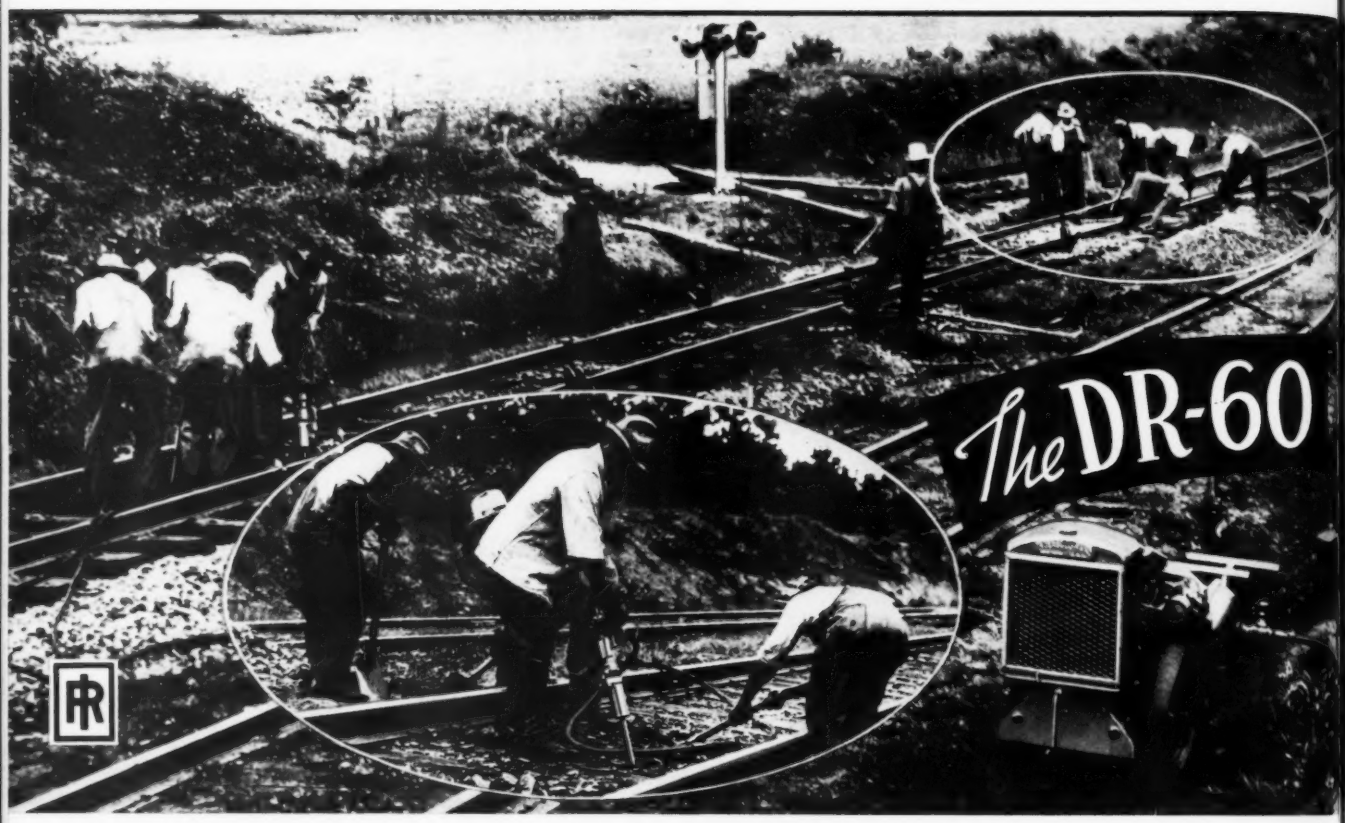
FAIRMONT A5 SERIES C—3 to 8 man gang car. Powered by 36 h.p. engine, this car can pull 13 trailers loaded with 260 men at 30 m.p.h. on level track.

FAIRMONT A3 SERIES C GANG CAR—Seats 3 to 8 men, pulls 1 to 7 trailers. The high torque developed by its engine at low speed makes it ideal for heavy duty work.

Performance ON THE JOB COUNTS

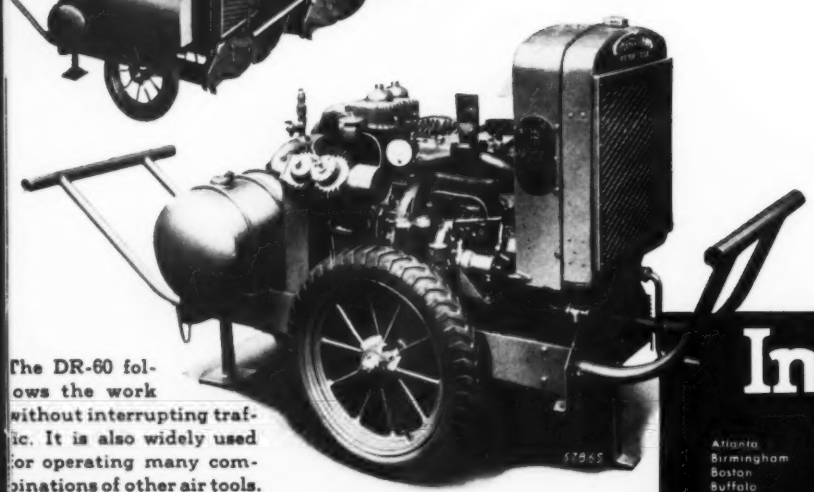
OF ALL THE CARS IN SERVICE TODAY ★ ★ *More Than Half are Fairmonts*

GIVE EACH OF YOUR SECTION GANGS A DR-60 SPOT TAMPER



The DR-60 shown above is operating five MT-3 tie tampers, one of which with cribbing fork (outlined) is loosening cribs at a road crossing renewal.

Hundreds of these units now in service.



The DR-60 follows the work without interrupting traffic. It is also widely used for operating many combinations of other air tools.

The DR-60 is an easily transported, lightweight, "off-track" two-stage air compressor, that was designed especially for railroad use.

It will furnish more than enough air to operate 4 MT-3 tie tampers plus one cribbing fork.

You will want to investigate this latest development in tie tamping equipment.

Ingersoll-Rand

11 BROADWAY, NEW YORK, N. Y.

Atlanta	Chicago	Detroit	Knoxville	Picher	Seattle
Birmingham	Cincinnati	Duluth	Los Angeles	Pittsburgh	St. Louis
Boston	Cleveland	El Paso	Newark	Pottsville	St. Paul
Buffalo	Dallas	Hartford	New Orleans	Salt Lake City	Tulsa
Butte	Denver	Houston	New York	San Francisco	Washington
		Kansas City	Philadelphia	Scranton	

FLEX-TOE

REMOVES STUBS . . . .
DON'T DRIVE THEM DOWN

- PULLS SPIKES AND BOLTS OF EVERY DESCRIPTION . . . .
- REDUCES SPIKE PULLING COSTS 33% . . . . . .
- SAVES TIES . . . . . .
- IMPROVES SAFETY RECORDS

Here is a REAL improvement in railway tools. The Flex-Toe claw bar pulls spikes that were heretofore impossible to remove, and in addition the spike pulling job becomes safer. The bar is thrown on spikes in the usual manner. The toes of the bar grab hold as if they were the prongs of a powerful pair of forceps . . . the harder the handle of the bar is pulled to remove the spikes, the tighter these toes hold on. Even the headless, brine-eaten variety of spikes as well as drift bolts come out. And, spikes may be removed from those hard-to-get places by one man WITHOUT A HELPER. Flex-Toes will pay for themselves by reducing spike pulling time. Write today for prices and literature.

WARREN TOOL CORPORATION • WARREN, OHIO

✓ Check these

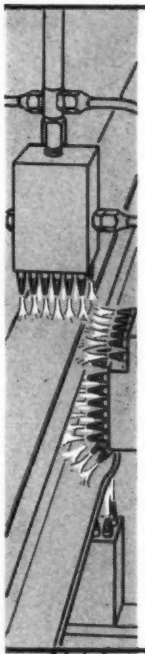
They Can Conserve Materials—Forestall Problems of Replacement Parts—and are Important to Speedy and Safe Transportation of Essential Supplies

THE railroads have for many years carried on programs of reclamation and repair as a necessary part of economical operation. Today's requirements have greatly intensified the need for such work. Accepted standards of what should be reclaimed must be broadened. Because fullest utilization of existing parts and materials is essential, *any* useable parts and materials should be reclaimed.

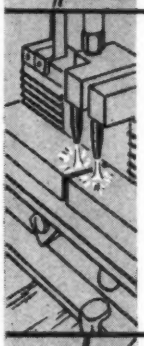
The methods and service which the Oxweld organization provides are entirely directed toward helping the railroads to do this. In addition to Oxweld procedures for economical *reclamation and repair,* effective Oxweld methods have been developed to *retard* wear or corrosion, and thus to forestall problems of replacement parts and materials.

It is suggested that the Oxweld methods shown here be reviewed and all those which can be advantageously applied checked off for use in way and structures programs for 1942.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building Chicago and New York



Butt-Welding of Rails—when rails are joined by means of oxy-acetylene butt-welding, batter and joint maintenance are completely eliminated and a smooth-riding rail surface which reduces vibration, noise, and impact is provided. For these reasons, oxy-acetylene butt-welding is particularly advantageous in tunnels, on bridges, in station platforms, and on overhead structures. *When butt-welding is done by means of the mechanized pressure-welding equipment which Oxweld makes available, the weld produced has superior strength and physical characteristics without requiring any added essential materials in its making.*



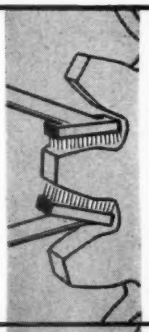
End-Hardening of Rail—all available new rail must be made to last as long as possible. Oxy-acetylene end-hardening with Oxweld equipment prolongs rail life because it imparts a hard, batter-resistant end to new rail. *The work is done in track without interruption to traffic.*

Rebuilding of Rail Ends — use of this Oxweld method saves rail replacements now when steel mill output is so greatly needed for other vital uses. The improved Oxweld MW welding rod produces a deposit which is *more batter-resistant than the original rail metal.*

SINCE 1912—THE COMPLETE

OXWELD METHODS..

Repair of Worn Trackwork — worn switch points, crossings, points and wing rails of frogs, and other worn trackwork which today is difficult to replace *can usually be restored to a good-as-new condition by means of oxy-acetylene welding so that its useful life is prolonged.*



Flame-Hardening — this is a recommended method for giving the wearing surfaces of metal parts additional hardness which makes them last longer. *It is applied advantageously to such work equipment parts as gears, sheaves, crane wheels, and caterpillar tracks.*

Flame-Cleaning — loose paint, scale, rust, and surface moisture can be quickly removed from structural steel by means of oxy-acetylene flame-cleaning. *Done just before painting, the paint then goes on the warm, dry, steel faster, bonds tighter, and lasts longer.*

Hard-Facing — parts subjected to severe abrasion, heat, or corrosion can be made to last many times longer when wearing surfaces are hard-faced with Haynes Stellite alloy. *Typical parts suitable for hard-facing are tamper bars, shovels, grader blades, and bucket teeth.*

Welded Piping — welded piping systems for all types of service remain leakproof and maintenance-free for the life of the pipe — because the welds are as strong and ductile as the pipe itself. *In addition, many fittings and layout drawings can be completely eliminated.*

Repair of Retarder Parts — car retarders and many other items of classification yard equipment can be repaired by oxy-acetylene welding. *Included among these parts are shoe beams, crank arms, operating bars, girders, spring rods, skates, and retarder framework.*

Restoring Worn Joint Bars—when worn joint bars are left in track, they contribute to track deterioration. Worn bars can be economically reclaimed to restore a made-to-order fishing surface by *oxy-acetylene flame-straightening in track, or by means of oxy-acetylene welding.*

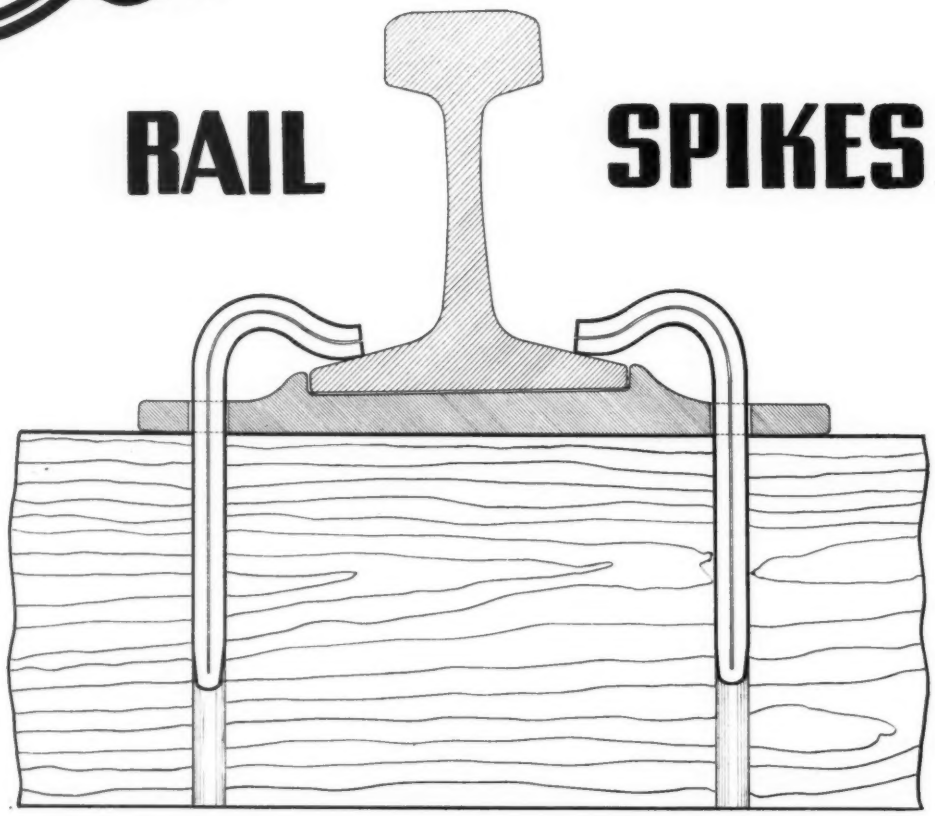
Reprints of these pages are available for distribution to members of your organization to help plan full utilization of Oxweld services. If you would like to have copies, write for them, specifying the number you require. They will be sent to you without obligation.

OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

The word "Oxweld" is a registered trade-mark of a Unit of Union Carbide and Carbon Corporation

Elastic

RAIL SPIKES



WHAT THEY ARE AND WHAT THEY DO

ELASTIC Rail Spikes, made of high grade spring steel maintain heavy spring pressure on base of rail and thus anchor the tie plate. By their use tie plate abrasion, spike killing of ties, rail creepage, maintenance costs, and steel consumption are reduced, and better gage is maintained. They are easy to apply and effective in service.

ELASTIC RAIL SPIKE CORPORATION

Affiliate of Bernuth, Lembcke Co., Inc.

420 LEXINGTON AVENUE NEW YORK, N. Y.

Houston » Pittsburgh » London

Chemical WEED CONTROL

A STANDARD LABOR-SAVING METHOD

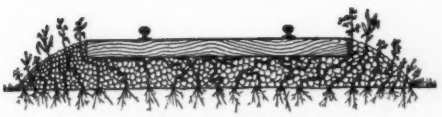
ATLAS "A" ARSENICAL

ATLACIDE CHLORATE WEED KILLER

RAILROAD maintenance engineers everywhere realize that chemicals provide the answer to the weed problem. The old-fashioned, inefficient hand-weeding methods are an expensive and purely temporary remedy.

ATLAS "A" or ATLACIDE kills roots with a resultant reduction in the amount of weed growth with each treatment. As weed growth disappears, track conditions are improved, less chemical is required and maintenance costs are reduced. The ultimate goal of clean track maintenance at a minimum cost is soon reached.

The use of ATLAS "A" or ATLACIDE to eradicate weed growth allows maintenance men to concentrate on other important work necessary to a well maintained track.



Before Treatment

After Treatment—ROOTS DIE

Final Result—CLEAN BALLAST

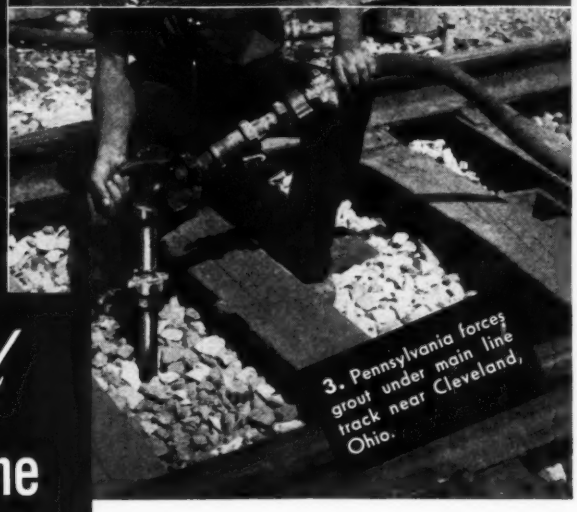
CHIPMAN CHEMICAL COMPANY, INC.

BOUND BROOK, NEW JERSEY

Chicago, Ill. • Palo Alto, Calif. • Houston, Tex. • No. Kansas City, Mo. • Winnipeg, Can.

1. Illinois Central puts precast concrete slabs under track on high fill near Vicksburg, Miss.

2. Frisco grouts ballast under track on busy grade crossings in Birmingham, Ala.



3. Pennsylvania forces grout under main line track near Cleveland, Ohio.

What ever the method **CONCRETE** under the track spreads the load!

For smoother riding, faster track, and to cut costs of maintaining "soft spots" in the line, railroads today are looking for economical methods of "spreading the load" under the track.

Three ways to do this with concrete are:

1. PRECAST CONCRETE SLABS under ties and ballast to strengthen the track over poor subgrades.

2. GROUTING SUBBALLAST in place at soft spots. This can be done without delaying traffic.

3. FORCING CEMENT GROUT into water pockets and voids by pressure to stiffen the subgrade where it is weakest.

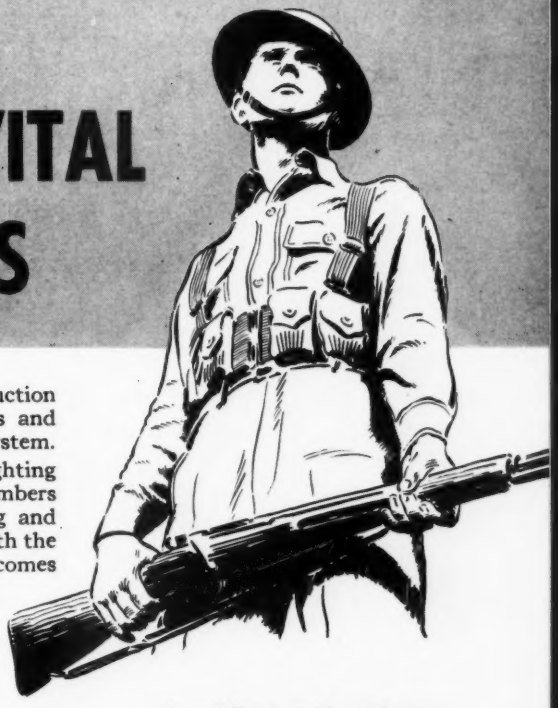
All of these methods, which can be carried on without breaking track, are undergoing experiments on American railroads now. For latest information on how concrete can help solve your track support problems, call on us.

PORTLAND CEMENT ASSOCIATION
Dept. 3-27, 33 W. Grand Ave., Chicago, Ill.

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

GUARD AGAINST SABOTAGE NOW

BY FLOODLIGHTING VITAL TRESTLES and BRIDGES



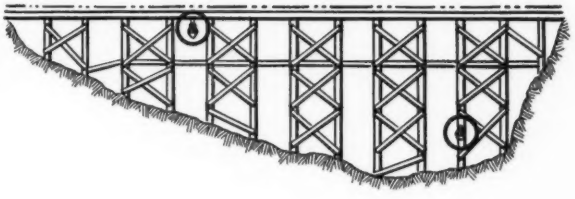
TO KEEP war materials moving, start guarding against destruction now—and do it with light. Saboteurs may slip past guards and barriers but they can't evade a well-planned protective lighting system.

Alert to the needs and requirements, leading railroads and G-E lighting engineers recommend lighting the piers, abutments, and structural timbers instead of the bridge deck. With the ***supports*** lighted, trespassing and malicious destruction of property are definitely discouraged. But with the ***deck*** lighted, the ground or water level is in the shadows, and it becomes necessary to patrol with electric lanterns. Guards carrying lanterns are not only excellent targets, but have limited visibility.

Right in your division, there may be a dozen spots where protective lighting can help keep essential war materials moving. Why not ask a G-E lighting specialist to help you make the best installation for each trestle and bridge? To bring him to your desk just phone the nearest G-E office. Or write ***General Electric, Schenectady, N. Y.***

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

TRESTLES LESS THAN 40 ft HIGH

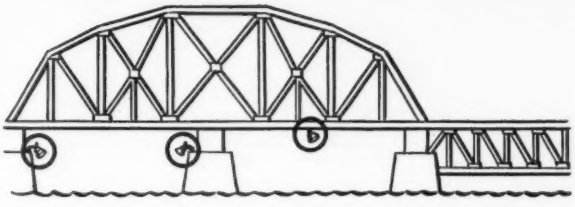


Where trestles are less than 40 feet high, Form 79S street-lighting luminaires suspended from the floor timbers are recommended. Luminaires should be mounted approximately 100 feet apart to prevent shadowy areas and provide acceptable lighting if one lamp should fail. The symmetrical light-distribution pattern illuminates a wide area to either side of the footings. A spring hanger should be mounted between the bracket and luminaire to lessen effect of vibration on the lamp.

TRESTLES MORE THAN 40 ft HIGH

Form 79VR street-lighting luminaires mounted on the outside vertical structural timbers are recommended for higher trestles. Units should be mounted 25 feet high and spaced from 150 to 250 feet apart. The universal-mounting bracket has horizontal and vertical adjustment to compensate for rake and to light a wider approach area. Guards on the bank, screened from the saboteur by the glare of the luminaire, have a clear view parallel to the trestle.

BRIDGES WITH PIERS LESS THAN 100 ft APART



Here narrow- or wide-beam floodlights should be mounted on each pier to throw light on the adjacent pier. The number of units required will depend on the size of the pier and, in general, one watt per square foot of pier area will be sufficient. Some light should spill onto the surrounding water but, if the river is navigable, care should be taken to prevent glare on approaching craft.

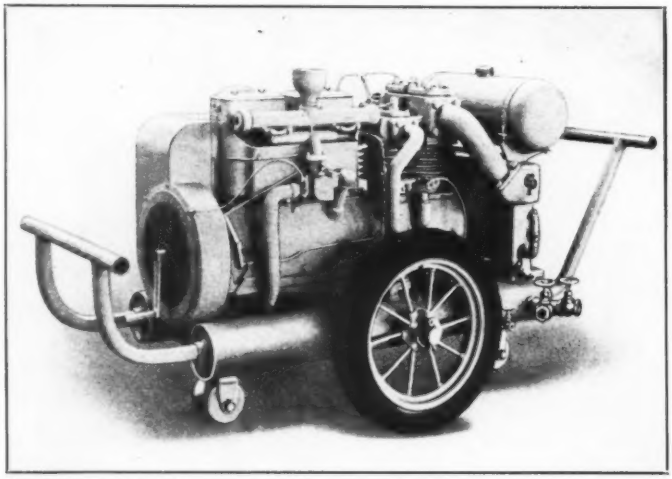
BRIDGES WITH PIERS MORE THAN 100 ft APART

These are lighted most economically with narrow- or wide-beam floodlights mounted under the deck plate girder spans. A spring or rubber plate should be mounted between the deck and the floodlight to dampen vibration. Enclosed-type floodlights are recommended for all applications because the door glass protects the reflector interior from penetration of moisture, smoke, and dust.

GENERAL ELECTRIC

451-67-3209

"PATROL" COMPRESSOR COMPLETELY AIR-COOLED



↑ WHEN AIR SUPPLY exceeds demand, unloading inlet valves are automatically held open. An automatic throttle slows the engine to idling speed during these unloading periods and speeds it up again just prior to reloading.

NO RADIATOR OR WATER SYSTEM TO LEAK OR FREEZE

Built for Year-Round Operation

NEW YORK – Latest aid to more efficient maintenance-of-way is the Chicago Pneumatic "Patrol" Tamper Compressor, an all-weather unit for spot tamping and other track or bridge repairs. Both the gasoline engine and the two-stage compressor are completely air-cooled, eliminating danger of freezing. The four-cylinder Wisconsin gasoline engine has 50% more power than the "Patrol" Tamper Compressor requires, a liberal reserve which permits satisfactory operation even at high altitudes.

CHICAGO PNEUMATIC TOOL COMPANY

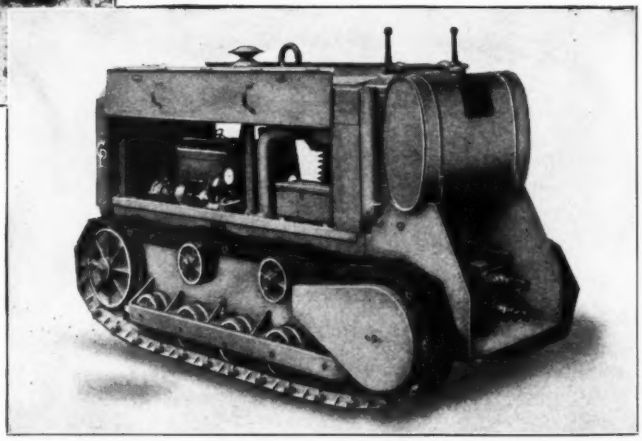
General Offices: 8 E. 44th St., New York, N. Y.

60 CUBIC FEET → of free air per minute at 100 pounds pressure is the actual capacity of the CP "Patrol" Compressor. It will operate four CP-3D Tie Tampers or two CP-116 or CP-117 Cut-Spike Drivers or an alternate number of other pneumatic tools.

CP EQUIPMENT FOR BRIDGE AND TRACK WORK

Send for a copy of SP 1943 describing in detail the following CP Time-Saving tools:

CUT-SPIKE DRIVERS • WOODBORERS • SCALERS • CHIPPERS
WRENCHES • RIVETING HAMMERS • METAL DRILLS • GRINDERS
SINKER DRILLS • RAIL DRILLS • RIVET BUSTERS • HOLDER-ONS
DEMOLITION TOOLS • SUMP PUMPS • CONCRETE VIBRATORS
BACKFILL TAMPERS • CONCRETE SURFACERS • PAVING BREAKERS
SCREW-SPIKE DRIVERS • BONDING DRILLS • WIREBRUSH MACHINES
BLOW GUNS, PAINT SPRAY or SAND BLAST NOZZLES



↑ 8 TOOL AND 12 TOOL CP CRAWLER COMPRESSORS two-stage, air-cooled; gasoline or Diesel engine driven. Propel themselves in either direction along the job or onto a flat car or hand car. Travel between or across the rails or on the track shoulder. Hinged side doors.

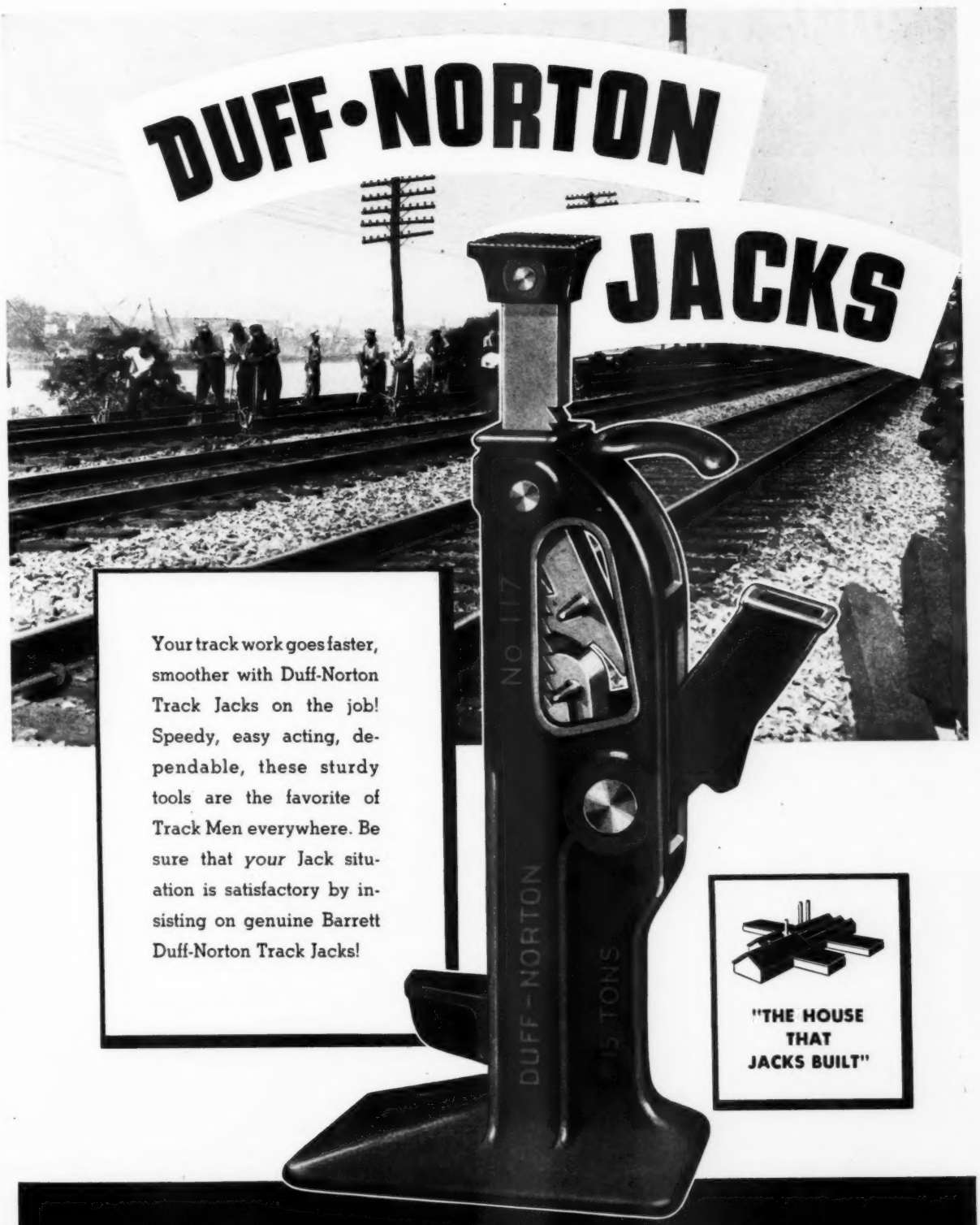
CHICAGO PNEUMATIC

AIR COMPRESSORS

ALSO: Pneumatic Tools, Electric Tools, Rock Drills, Hydraulic Aviation Accessories, Diesel Engines

PORTABLE
STATIONARY
AIR OR GAS
MOTOR DRIVEN
STEAM DRIVEN
DIESEL ENGINE
DRIVEN

DUFF·NORTON JACKS



Your track work goes faster, smoother with Duff-Norton Track Jacks on the job! Speedy, easy acting, dependable, these sturdy tools are the favorite of Track Men everywhere. Be sure that *your* Jack situation is satisfactory by insisting on genuine Barrett Duff-Norton Track Jacks!

"THE HOUSE THAT JACKS BUILT"

THE DUFF-NORTON MANUFACTURING CO.
PITTSBURGH, PA.

Canadian Plant:
COATICOOK, QUEBEC

Representatives in
Principal Cities

NOW—MORE THAN EVER You Need ....

R.M.C. PLASTIC

Reduces Rail-End Batter

Reduces Joint Maintenance Costs, Labor, Materials

Eliminates Periodic Hand Oiling of Joints

Prevents Kinked and Humped Track

R. M. C. PLASTIC...*PREVENTS CORROSION and LUBRICATES RAIL JOINTS*

Yes . . . Now more than ever you need R. M. C. Plastic to keep your rail joints properly lubricated and 100% corrosion-free!

For only one, low cost application of this compound will prevent joint "freezing," excessive rail end batter, excessive parts renewals, and other harmful effects of corrosion and poor joint lubrication . . . harmful effects that waste steel and maintenance labor at a time when both are scarce.

The method of applying R. M. C. Plastic is such that every section of the joint assembly—nuts, bolts, fishing surfaces, shanks—is thoroughly protected and lubricated. Joints remain free to expand and contract properly and will not freeze to cause kinked and humped track.

Remember, only one packing of joints with R. M. C. Plastic is needed . . . and its low cost invites its immediate use.

Visit Our Space No. 31 At The N. R. A. A. Exhibit, Palmer House, Chicago, March 16, 17, 18, 19.

End CORROSION HERE

R.M.C. PLASTIC

RAILWAY MAINTENANCE CORP.

PITTSBURGH PENNSYLVANIA

THE BARCO WAY

REDUCES TYTAMPING TIME LABOR and COSTS TO A MINIMUM

BARCO GANG TAMPING

12 Barco Tytampers Operating From a Small, Compact, Off-The-Track And Out-Of-The-Way Power Plant Costing Less Than $100.

BARCO SPOT TAMPING

Each Barco Tamping Unit Is Self-Powered And Easily Carried By One Man. No Other Equipment Needed.

6 YEARS SATISFACTORY SERVICE
NOW USED BY 83 RAILROADS

Visit Our Space No. 48 at The N.R.A.A. Exhibit

BARCO MANUFACTURING COMPANY

1805 W. Winnemac Ave. — NOT INCORPORATED — Chicago, Illinois

In Canada THE HOLDEN COMPANY, LTD.

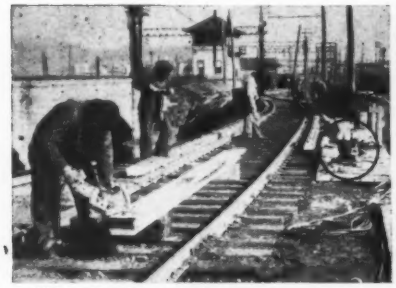
Montreal — Moncton — Toronto — Winnipeg — Vancouver

It puts you On the Right Track

FOR QUICKER REPAIRS... FOR LOWER MAINTENANCE

Give your maintenance crews Homelite Portable Generators and you'll get your work done quicker, with less man power, and at lower cost. Your men simply take these easily portable 83 pound units out on a job with them and they have on hand an ever-ready supply of 1800 watts—power that can be used to profit in operating electric tools and floodlights.

Railroads all over the country are using Homelites because they do their work better and longer. They're plenty rugged. And they operate by a built-in gasoline engine that needs practically no manual attention. Voltage control is completely automatic.



With a Homelite Portable Generator you can operate electric hand saws, drills, dappers and others—several at a time. And you can get enough juice out of a Homelite to push these tools to the limit.

Homelites are money-savers on night work. They produce enough power to operate several brilliant flood and spot lights. They give your men the light they need to work faster, safer, and more efficiently.

Homelites will double-up on their work. On night emergencies, where time is essential, you can use your Homelites to operate electric tools and floodlights both at the same time. There's plenty of power in a Homelite.

Don't let Your HOMELITES get Side Tracked

- Keep your Homelites in good condition.
- Mix ½ pt. of No. 30 oil with each gallon of gasoline used.
- Don't use the choke for a throttle.
- Keep spark plugs in good condition.
- Keep the carburetor set on the lean side.
- Keep engine free of carbon.

Send for this Book

A Homelite is rugged—but with all good machines a little care saves a lot of wear. Send for this operating instruction manual that shows how to keep Homelites running longer and better.

HOMELITE

CORPORATION

2103 RIVERDALE AVE., PORT CHESTER, N. Y.

Let Them Help You Keep Your Equipment ON THE JOB

TO GET maximum efficiency from International Industrial Power during the busy days ahead, give it the best of care. Make use of *the men who know this equipment best.* They are *the men who sell it* and *the men who service it.* They are the International Industrial Power dealers and their servicemen from coast to coast.

Through up-to-date, Company-issued service manuals and bulletins and through contacts with Company servicemen, the International dealer's service department is continually kept informed of the best methods and practices for servicing International TracTracTors, Wheel Tractors, and Power Units. You get the benefit of this information when you bring in your equipment for servicing. It can save you many a dollar, many a delay, in expert, reasonably-priced preventive maintenance and overhaul.

The user, dealer, and serviceman all benefit by International Harvester's background of quality manufacture, engineering, and metallurgical experience. International Industrial Power is made for the toughest going. International Service *keeps it working.*

Your tractors and power units have *a big job to do* in America's March to Victory. Keep them *serving well* by keeping them *well serviced.*

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

Time-Saving, Money-Saving INTERNATIONAL TracTracTor Service Helps

CARE, OPERATION, ADJUSTMENT

Fuel, Oil, Lubricants—Store in clean, covered containers. Use products of high quality and correct grade.

Air, Fuel Cleaners—Clean them regularly.

Tracks—Adjust slack and tension for best work.

Nuts, Bolts—Go over them frequently; keep them tightened.

Oil Screens—Clean regularly; replace filter element as instructed in operator's manual.

Steering Clutch Levers, Steering Brake Pedals—Adjust to suit operator.

Read, study your operator's manual for other money-saving suggestions.

MAINTENANCE

Unit Replacement—Saves time.

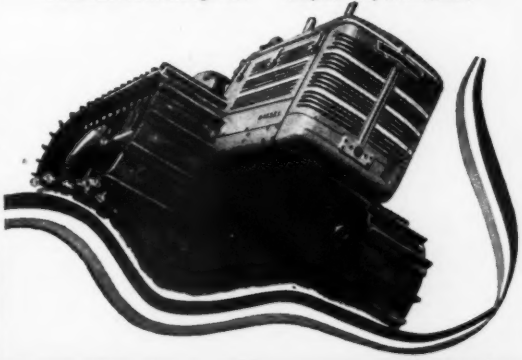
Sleeves, Pistons—If and when replacements are necessary, matched sets can be quickly, easily installed.

Crankshaft Bearings—Replace when needed; no fitting or reaming necessary.

Transmission—Inspect and adjust regularly.

Transmission Bearings—Replace when wear occurs (this eliminates other expensive replacements).

Steering Clutches, Brakes—Inspect and adjust regularly; replace as needed. Clutches and brakes can be removed without disturbing bevel gears, sprocket drive gears and shafts, track frames, or track rollers. Adjustment of either clutches or brakes can be done independently of the other.



INTERNATIONAL Industrial Power

WOODINGS-VERONA TOOL WORKS

VERONA, PA.

Since 1873

We will exhibit at the

NATIONAL RAILWAY APPLIANCES
ASSOCIATION SHOW

Held in collaboration with the

AMERICAN RAILWAY ENGINEERING
ASSOCIATION CONVENTION

March 16 - 17 - 18 - 19

Where it will be a pleasure to greet our friends

Convention *and* Exhibit

Palmer House

Chicago, Illinois

WOODINGS FORGE *and* TOOL COMPANY

VERONA, PA.

MORRISON *Is In the Front Line...*

With 6 DIRECT HITS in the Battle Against Wear & Tear And The Ravages of Decay:

1. More than thirty Trunk Line Railroads and many large Industrials utilize "Morrison Metalweld Process" portable service in the maintenance of their track frogs and crossings. More than ten years of GUARANTEED service have established this method pioneered by Morrison.

2. Plant fabricating facilities combined with experienced, portable erection and welding crews enables "Morrison" to provide complete service in steel repairs to bridges, signal towers, and other steel structures requiring reinforcing or maintenance.

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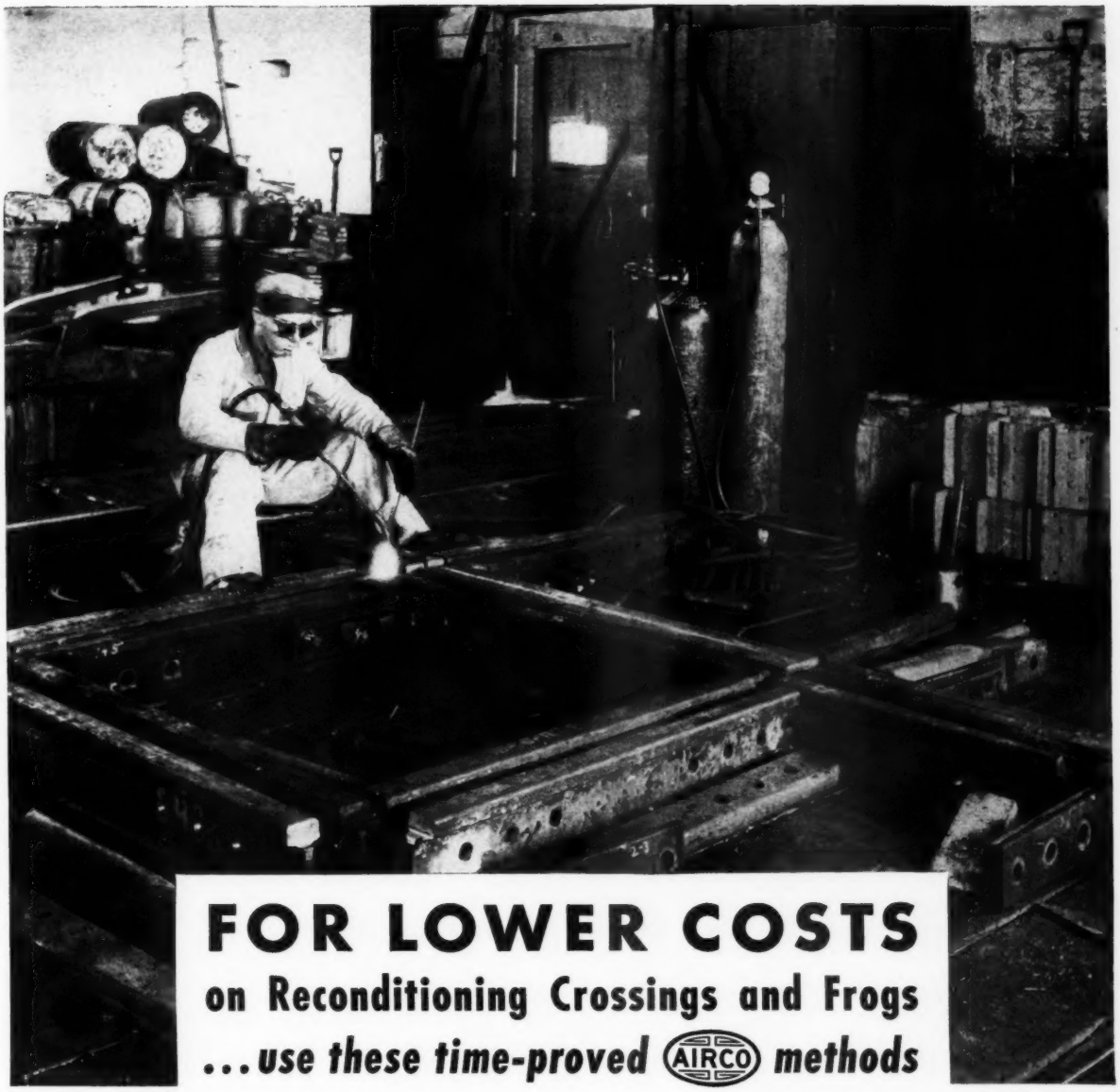

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No. 159 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: It's Great to Be a Railroad Man

February 21, 1942

Dear Reader:

When in Washington last week, I heard Donald Nelson, the nation's No. 1 man in wartime production, emphasize that time is the all-essential factor in our nation-wide conversion from peace time pursuits to those of war. "1942," he said, "is the critical year in our history." Posters throughout his offices reading "The Time Is Short" expressed the keynote of his own actions.

And as I went about Washington, calling on other leaders in public life, I found an appreciation of the indispensability of railway service that was most heartening to those of us who are a part of this industry. As stated by one man, whose name is known today in every household in this country, "Of what purpose is it to make munitions in vast quantities if we can't transport them to the points of need after they're made? And the railways are surprising all of us," he added. The commendation of railway performance is so widespread, in fact, that it is becoming a very real handicap to the efforts that Commissioner Eastman is making, in his capacity as director, Office of Defense Transportation, to secure for the railways the steel and other critical materials that they need, for some persons in positions of high authority in the allotment of these materials find difficulty in realizing the necessity for the assignment of these materials to the railways when they are doing so well. Fortunately, the spokesmen for the railways are making progress in convincing these authorities that this railway service can be continued only as the current extraordinary wear and tear on the railway properties is made good.

To all of us, the truly remarkable performance of the railways is a cause for keen gratification. At the same time, it comprises, I am sure you will agree, a challenge to each of us to do his utmost individually to insure the continuation of this record – not solely or even primarily to satisfy our pride but rather to meet a national emergency and contribute to early and complete victory. More than ever before, in 1942 we can truly say that "it's great to be a railroad man" because of the opportunity that this vocation affords us to be of service to our country.

Yours sincerely,

Elmer T. Howson

ETH:EW

Editor

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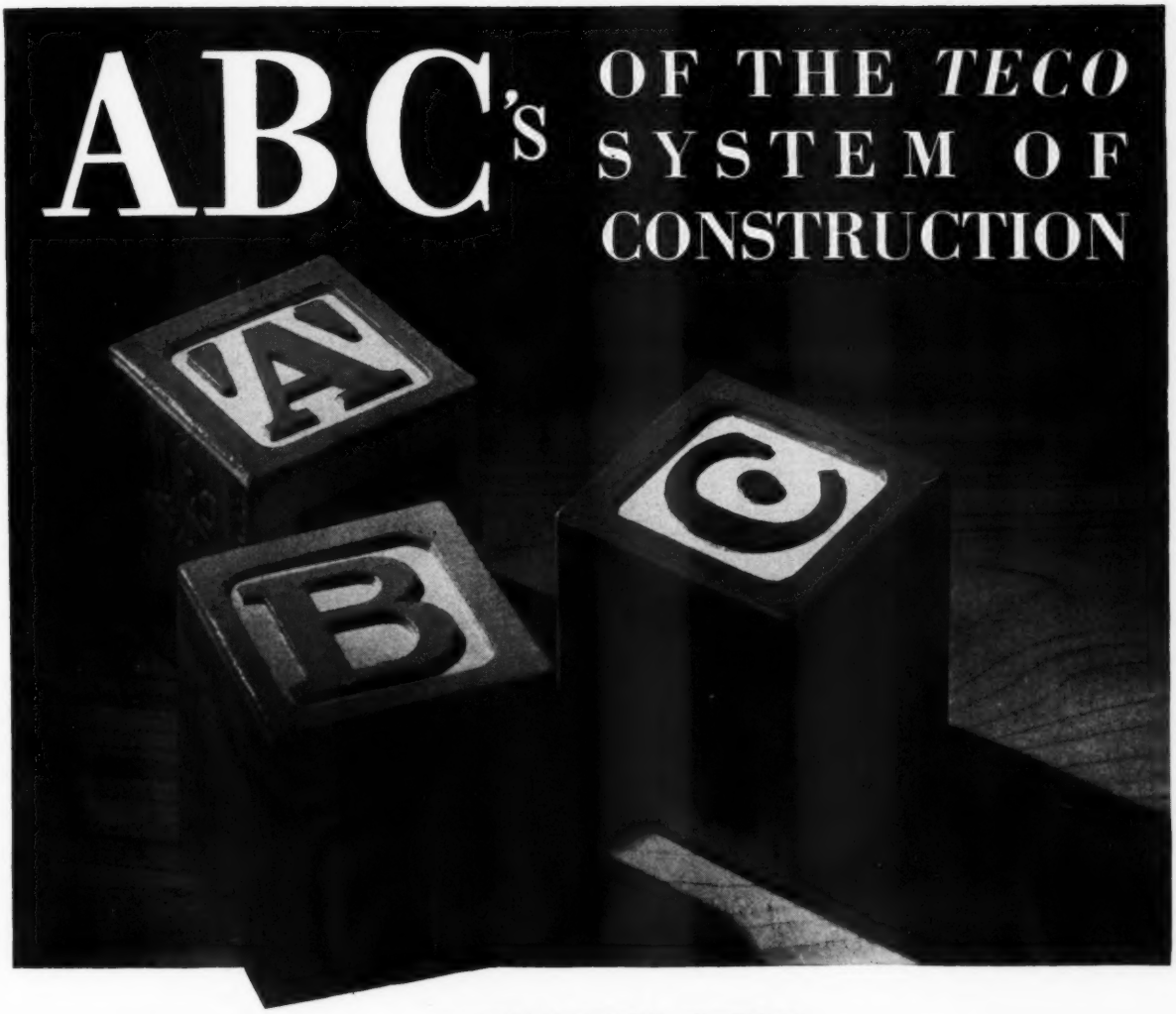

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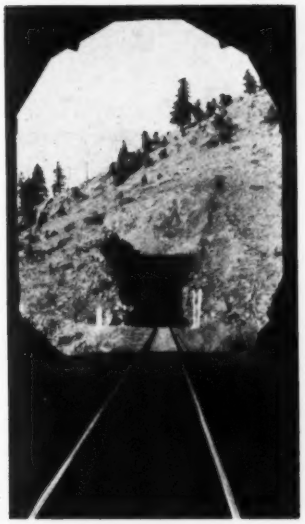

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Railway Engineering and Maintenance

At War

Railways Render Unparalleled Service

OUR country is now at war. This is a new experience for a large part of those now in railway service. And this is a different kind of a war than has ever been waged before—in number of men involved, in area included and in the degree of mechanization developed. For all of these reasons, transportation must play a larger part than ever before—and this transportation is, for all practical purposes, railway transportation. For this reason, a greater responsibility now rests on railway employees than in any previous war—a responsibility that those in railway service and the public alike should recognize.

In times of war, the service the railways are called on to perform is two-fold—it must meet the civil needs as in more normal days; and it must meet the added needs of the armed forces. These latter needs are again two-fold, including the transportation of the materials entering into the production of the implements of war and the movement of the forces themselves with their supplies and equipment. In all these respects, the railways have made remarkable records in recent months.

Record Civilian and Troop Traffic

Take their performance last October, as an example, for October is normally the month of maximum demand for railway service; it was so last year. In that month they carried 47,734,000,000 tons of freight one mile—a figure so large as to be meaningless to the average person. It is appreciated best by stating that it exceeded by six per cent the highest monthly record ever attained by the railways of the United States (in October, 1928). And they established this new high record of service with about 600,000, or 36 per cent, less freight cars and about 18,000 less locomotives. Still more remarkable, they maintained an average surplus of more than 40,000 cars throughout this period.

This record was made possible by the more efficient use of the railway plant. Specifically, the average carload, or tons per loaded car, was increased from 27.0 in October, 1928, to 29.2 in October, 1941, or 8 per cent, while the miles per car per day were increased from 36.2 in October, 1928, to 45.1 in October of last year, or 25 per cent. As a result, the service rendered by each car rose from 627 ton-miles per car per day in October, 1928, to 852 ton-miles per car per day in October, 1941, an increase in the efficiency of car utilization of 36 per cent.

In moving the armed forces and their materials, the railways have made an even more remarkable record. Following the treacherous and unanticipated attack on our forces at Pearl Harbor, and our declaration of war on the axis nations immediately thereafter, our military and naval authorities undertook the movement of men and material in volume never before met in this country, if in the world. Without opportunity for preparation or for dress rehearsal, our railways faced the task with such efficiency that within a period of six weeks after Pearl Harbor, they had moved more than 600,000 men of the armed forces, mostly for distances of 1,500 miles or more, together with their equipment. One railroad moved 200,000 soldiers and their equipment from six camps on its lines. Another road had 60 special trains on its lines for three consecutive days, while still another road was moving 46 special trains at one time. So well was this emergency met that every man was handled in passenger equipment. As a matter of fact, two-thirds of them were provided with sleeping car accommodations.

This performance is all the more remarkable because of the fact that it came at the time when the railways were handling their peak civilian passenger travel incident to the Christmas season. And to make matters still more difficult, the temperature throughout a large part of the country dropped to the record low for the winter. Yet this huge military movement, believed to be the largest in the history of the world, was handled with so little interference with the year's peak civilian passenger traffic that few were aware of it.

Credit for Maintenance Men

These achievements reflect great credit on the railways and on every employee thereon. They constitute a service to the public in the hour of national emergency that merits and has been accorded widespread commendation. But the railways and their employees cannot rest on these laurels, for still more strenuous days are ahead and these days will tax the ability and the initiative of maintenance of way forces just as realistically as they will those of the train service or the car and locomotive departments.

It has long been a slogan of maintenance of way men that a railway can be no better than its tracks and structures. It is incumbent on maintenance men, therefore, to see that their tracks and structures are in proper condition to carry whatever traffic the public and our armed

forces may require. This is *their* definite responsibility.

To maintain their properties, they will need rail and many other materials in quantities; they will secure some but it is probable that the demands of armament will deprive them of a part of their needs, possibly a large part. They will need more men, at a time when the call of the armed services and the defense industries will make it more than usually difficult to maintain even normal forces. And the volume of the traffic and the speed at which it must be moved will add to the necessity of doing all work in such ways as will reduce interference with the movement of traffic to the practical minimum.

Difficulties Present Challenge

All these conditions will add materially to the difficulty of doing work; they are very real obstacles. They will require ingenuity in the conduct of the work; they will require greater care in the use of materials, to secure more service from them; they will require substitution of less desirable for critical materials.

But difficulties are not new to maintenance forces, schooled as they are to meet emergencies of many kinds—derailments, washouts, blizzards, etc. They have long been accustomed to face such difficulties as "all in a day's work" and to take them in their stride. And they will face the strenuous days in the season that is about to open with the same determination to keep their lines open, come what may, spurred on by the added knowledge that this year they are in a very real sense the country's second line of defense, and that the tracks and structures which they are maintaining provide the means over which the tanks, planes, munitions and other vitally necessary supplies are moving to the men at the front.

Building Work—

No Shortage of Essential Materials

AFTER many years of enforced neglect, the "stepchild" of railway facilities—buildings—received increased attention during 1941, and a considerable number of passenger stations were repaired, renovated or modernized, with most effective results. That this all-too-meager attention to buildings, with respect to their actual needs, should now be withheld because of fancied shortages of necessary materials, would be as unfortunate from the standpoint of the railroads as it would be unnecessary—unfortunate because, as often as not, modernization work, and not infrequently, new construction, employing modern materials that are available, can be carried out more economically than the routine repair of existing facilities, and unnecessary because, among the widespread shortages that do exist in many lines, there are relatively few in those specific materials that are essential to the building work that is needed on the railroads.

During 1941, to cite a few instances of station improvement work during that year, the Southern Pacific built new and attractive stations at Palo Alto, Alhambra and Pomona, Cal., and modernized its stations at several other points; the Pennsylvania and Erie modernized their joint station at Mansfield, Ohio; the Texas & Pacific modernized its station at Shreveport, La., and the Louisiana & Arkansas and the Kansas City Southern modernized their Union station at this point; the Denver & Rio Grande Western built a new and modern station at Salida, Colo.; the Missouri Pacific built modest, yet strictly modern stations at Arcadia-Ironton and Piedmont, Mo., and modernized its stations at Wichita, Kan., Warrensburg and Kirkwood, Mo., and Alexandria, La.; and the Chicago & North Western modernized its passenger stations at Milwaukee, Eau Claire, Oshkosh, Appleton and South Beaver Dam, Wis., and Rochester, Minn., and is now modernizing its station at Neenah, Wis.

Why these stations were built or modernized is a question that would be asked only by one unfamiliar with the condition of the former facilities as to adequacy, appearance and estimated cost of routine repairs, but here are the reasons pertaining to at least a few of them. At Salida, the new station provided by the D. & R. G. W. was designed for joint use with the railroad's Motorway subsidiary, and, through the consolidation of other public and railway office facilities, replaced four old buildings, the pressing repair of which would have cost possibly as much as the new structure.

The Missouri Pacific modernized its stations to meet the requirements of improved service and increased passenger business (in part occasioned by the large army cantonments and rapidly expanding airplane manufacturing industry on its lines) and, in some cases, to effect economies through improved and consolidated facilities. And the station work on the Chicago & North Western in 1941, while done primarily to improve appearance and facilities generally commensurate with its new streamlined trains, was stimulated to a large extent by actual need and public demand.

Equally as necessary as in these stations, both economically and physically to meet changed demands, is the need for the modernization of stations at many other points on the railways, much of which work should go forward during 1942, and which can go forward unaffected by shortages in materials and without in any way interfering with the country's war efforts.

Railway building men should know, if they have not already been appraised, and they should not leave their superior officers ignorant of the facts, that building materials generally, other than steel and certain metal specialties, are not on the "scarce" list. For example, there is no shortage of cement, sand, gravel and stone for concrete, or of clay products, glass, gypsum, lime, asphalt, filler types of thermal insulating materials and paints. Furthermore, there is an ample supply of lumber, wood shingles, cement tiles and many types of wall and floor covering materials. And even in pipe and plumbing fixtures, manufacturers were assured as late as January 4 that they would be afforded sufficient raw materials to meet the needs of their customers to take care of their normal requirements for repairs and replacements, especially where the public health is concerned.

Coupled with the adequacy of materials for most classes of building repair and modernization work, is the development of effective substitutes to meet the requirements formerly met by materials now classified as scarce. For example, resin plastic dividing strips have been developed for terrazzo tile floors, replacing copper or bronze; plastics, in a variety of attractive colors, are also being used effectively for joint cover molds, table and

counter edging and other types of trim, replacing aluminum and other stainless metals; a new type of wood weatherstripping has been developed as a substitute for the spring bronze and zinc weatherstripping used so commonly in the past; lignum vitae sash pulley wheels are replacing iron and steel wheels; and concrete sash weights, made with a low-grade iron ore aggregate, are available for use instead of the former iron weights. In fact, effective double-hung window-operating assemblies are now available that include as little as one pound of metal per window, compared with as much as 37 lb. of metal per window common in the past with the weight, pulley and chain-type of assembly.

And so the list of readily available building materials and effective substitutes could be extended almost indefinitely. These may be reasons why individual roads will have to defer building work in 1942, but it will not be because of lack of need for such work, and not because of any lack of materials necessary to most effective and otherwise satisfactory work.

Work Equipment—

Essential to War-Time Maintenance

WORK equipment, which has been the theme of the March Equipment Economies issue of this publication for 24 years, has revolutionized maintenance practices during the last decade and has contributed far more to the present high state of railroad efficiency and economy than many realize, even among those closely associated with the revolution that has taken place. During the depression years, with low revenues and restricted maintenance allowances, work equipment was a boon to many railroads as a means of effecting economy and increased production. At the same time, it produced results of a higher standard and of a more permanent character, and removed much of the drudgery from many routine maintenance of way operations. In fact, many maintenance men are convinced that it was only through their work equipment that they were able to keep pace with the marked advances made in those years in train speeds and improved train operations generally.

In those days, the keynote of nearly every operation was economy, and while no industry can ever afford to overlook this factor, today, in the face of our country's huge war effort and the large and indispensable part that the railways are being called upon to play, that keynote has necessarily changed to one of maximum production. During the depression, while men, materials and equipment were to be had readily, demand was at a minimum. Today, due to our war effort, when men, materials and equipment are at a premium, work programs are expanding rapidly to keep pace with the heavy demands that are being made on the tracks, bridges and other elements of the fixed property in carrying a traffic that is exceeding that in even the boom days of 1929.

The fact that, through the depression period, maintenance men became equipment conscious and adapted machines to many of their recurring, arduous operations may prove to be one of the most fortunate developments of this period from the standpoint of the railways' war effort. Just as there are many maintenance men who question whether the tracks of the railways could have kept pace with improved train operation during the last decade without the aid of the equipment that has been developed for their use, so there are equally as many or more today who feel most keenly that it is only through the more extensive and intensive use of equipment during the days ahead that the roadbeds of the railways can be kept from becoming a limiting factor in the ability of the railways to handle our country's war transportation.

With adequate equipment, the maintenance forces can multiply the production of hand labor, reducing their demands for manpower, and thus releasing it for military service and other defense industry. With adequate equipment the tracks can be put up and maintained to a standard capable of withstanding the abuse of a high-speed, dense war traffic and, incidentally, through proper maintenance, minimize the abuse and extend the service life of rails, joints, bolts, spikes and every other element of the track structure. And with the latest type of work equipment, largely of the off-track type, it is not only being established that production can be largely increased through lack of interference by traffic but, of equal or greater importance at the moment, without interfering with the movement of traffic. This latter factor, of importance at any time, assumes major importance under today's heavy train movements because of the possible delay today of not merely single trains, but of fleets of trains in strategic military movements.

And to these advantages of certain types of modern off-track equipment can be added the all-important advantage that it minimizes, if not eliminates, otherwise necessary work-train service—the use of cars, locomotives and train crews so in demand for moving the military and non-military commerce of the country. That this, in itself, is no item of small importance is seen in the fact, as pointed out in an article elsewhere in this issue, that the Denver & Rio Grande Western, through the use of a relatively small amount of modern off-track equipment in routine maintenance operation, is saving more than a quarter million dollars in work-train expense annually. At an estimated cost of as much as $125 per 8-hr. work-train day, this means a saving of more than 2,000 work-train days a year on this road alone—giving some idea of the amount of power and rolling stock, and the number of train crews that can be released for other purposes by the railways as a whole through the greater use of self-propelled, off-track work equipment.

With knowledge of these facts, maintenance men, on whom rests the final responsibility for maintaining the roadways of the railways to an adequate standard to handle the country's war traffic, should make every effort to secure the work equipment they need to this end, and should seek to get the maximum production out of every machine on hand through intensive use, through skilled operation, and through the highest possible standard of maintenance and repair. To do otherwise is to fail their roads and their country in an hour of great need.

$8,600,000 for

Earth-Moving Equipment, Largely of the Off-Track Type, Has a Large Place in the Maintenance Budgets for 1942

DESPITE the record-breaking purchases of work equipment last year, when the railways bought 8,007 power machines and power tools, at a cost of $10,500,000, there will be a continuation of buying on a large scale in 1942, with the prospect that the purchases of this equipment during the year will approximate those of 1941. At first blush, this may seem to be a surprising statement, since the purchases made last year were not only the largest in the history of the roads, but they culminated seven years of intensive buying of all types of work equipment, with progressive increases every year, except in 1938. Present information indicates that the railways will spend $8,600,000 this year for 6,400 units of all types. However, these figures do not include small portable power-operated hand tools, used principally in bridge and building work, of which an increasing number are being purchased each year, and which are included in the purchases for 1941.

While the purchases in prospect are slightly less in both number of units and money involved than the purchases actually made in 1941, in making a comparison with previous years it must be remembered that the purchases in 1941 were 50 per cent greater than those of 1940 and that the latter year in turn showed an increase of 50 per cent over 1939. Moreover, as mentioned, the figures for the 1942 purchases do not include small portable tools, of which about 600 were purchased last year. Another reason for the indicated decrease is to be found in the restrictions that have been placed on the production of automobiles and motor trucks, so that no automobiles and only a few trucks are included in this year's budgets, whereas 424 highway vehicles were purchased in 1941. Again, during the last two years the number of types purchased has shown an increase, compared with earlier years, and present information indicates that, except for highway vehicles, the purchases in 1942 will be equally well distributed with respect to types.

As Many as Last Year

Taking all of these items into consideration, it will be observed that while there is an apparent reduction of about 1,600 in the number of units to be purchased, the indicated decrease in types other than highway vehicles is less than 600. Furthermore, in making this analysis it should not be overlooked that the records show that invariably the railways have purchased a greater number of machines and tools than were included in their budgets originally. For this reason, it may be expected that the number of units to be purchased in 1942, except highway vehicles, will at least approximate if not exceed the number purchased in 1941.

This forecast is based on information received from 36 roads that were asked what equipment they expect to buy this year. Complete and detailed information was given by 18 roads, representing 30 per cent of the railway mileage of the United States and Canada. All but two of the remainder from whom information was received have completed their budgets, but several of them have not yet received authority to make the desired purchases; several others placed orders last year for all of the equipment they expect to need in 1942; while four roads, believing that they will be unable to get delivery, have decided to give more intensive attention to repairs and get along with the equipment they already have.

Several officers stated that they had made a considerable reduction in their original estimates of their requirements, in the belief that the system of priorities will prevent the purchase of many of the units which they really need, and some of them indicated that their purchases will exceed their present budgets if allocations of the necessary materials will permit deliveries to be made. A few did not list the units they expect to buy, but most of this group said that they expect to buy as many as were purchased in 1941, with the prospect that their purchases will even be larger. Several gave only monetary totals for their budgets, and these were excluded from the foregoing estimate of 1942 purchases.

No Longer Questioned

It is of particular interest that in giving information concerning their budgets, many of the officers who participated in this survey indicated that the purchase of work equipment no longer needs to be justified to managing officers, but that the principal considerations are the funds available and

Work Equipment in 1942

Budgets Indicate Continuation of Buying on Scale Which May Equal or Exceed Record Purchases of Last Year

the selection of the machines that are most needed, as well as to insure that the purchases will be well balanced as to types. In other words, the time has passed when it is necessary to prove to management the economy of using power machines and tools.

Two Reasons Dominate

Two reasons seem to be dominant in the plans of the roads to continue large-scale purchases. The first, which was implied rather than stated directly, is the fact that has been mentioned that on most roads, both maintenance and managerial officers are convinced of the economic value of power machines and tools for maintenance operations and recognize the waste that results from continuing hand operations when power machines are available and can be used to advantage. The second reason, which was stated more explicitly by some officers, is the expectation that the maintenance forces, already reduced to about the minimum that can keep the track and structures to the standards required to handle the volume of traffic that is moving over the roads and to maintain the train speeds that are demanded today, will be depleted still further by inductions into the army and attractions of industries manufacturing ammunition and military equipment.

As these officers view the matter, the maintenance of the railways to present or even higher standards is as much a military necessity as the manufacture of arms and ammunition, for military operations can be hampered seriously and perhaps disastrously by failure to move men and supplies quickly and dependably to any point where they may be needed. For these reasons, maintenance officers forsee that, with the further curtailment of labor that is sure to occur as the war progresses, the deficiency in men must be made up by expansion in the use of work equipment.

Furthermore, some of those who remember how the development of

Top—Bank Widening Will Be Given More Attention. Center—Individual Tie Tampers Are Finding Wide Favor. Bottom—Most of the Cranes Bought this Year Will Be Crawler Mounted

work equipment was stimulated by a similar shortage of labor during the last war a quarter century ago, predicted that there will be an equal incentive in the near future to design new machines for purposes for which power machines and tools are not now available. Taking all of these circumstances into consideration, the belief was expressed that while the need for more work equipment is widely apparent today, this need will become more and more acute as the war effort gains headway.

While the total purchases of work equipment are of themselves of interest, information with respect to the latest trends in the use of power equipment and tools are of equal value to maintenance officers and manufacturers. For this reason, the chief engineers and engineers maintenance of way who were solicited for information concerning their plans were also requested to give detailed information concerning the number of units of each type of equipment they have included in their budgets.

In the replies that were received, 75 types of equipment were mentioned specifically, not including many small tools for bridge and building work, for these were listed as "small tools for bridge and building gangs," or as "complete outfits of small power tools." The lists of equipment given by individual roads cover a wide range with respect to both type and size for rail, for cleaning ballast and ballasting track, for grading, ditching and drainage, for weed destruction, for maintaining bridges and buildings and for practically all other maintenance operations for which power machines and tools are available. It can be expected with certainty, however, that many more types than the 75 that were listed will be purchased, for it is the invariable experience that, even when buying is restricted, the number of types purchased eventually is greater than the number listed in the budgets. When the roads are purchasing in larger volume, the actual purchases may range from 60 to 100 per cent more than contemplated originally.

For many years the amount of rail laid has been a reliable index of maintenance activities as a whole, during that year. The railways have informed the Office of Defense Transportation that they will require 1,600,000 tons of rail to meet fully the demands of defense transportation in 1942, and allocation of steel for the first quarter of the year by the War Production Board has been made on this basis. This is the largest amount of rail to be laid in any year since 1929. It is not surprising therefore, that despite the large number of adzing machines, bolt tighteners, spike pullers, spike drivers, rail cranes, rail drills, bonding drills, rail grinders and other related equipment, amounting to 473 units, that were purchased in 1941, the railways will purchase approximately 400 more of these machines during 1942. Among the newer equipment to be purchased for renewing ties will be tie nippers, tie cutters and tie pullers, types that have become available only recently.

The Railways Rely on Tractors to Perform Many Maintenance Operations from Grading to Providing Power for Small Tools

an equally wide range of maintenance operations, from ditcher-spreaders, locomotive cranes, tractors and auxiliary equipment, power shovels, draglines and combination machines, rail-laying, tie renewal and ballasting equipment, to clay diggers, jackhamers, portable grinders, and power wrenches and saws.

Many Types Included

These 75 individual types include other machines for mixing and placing concrete, for laying and maintaining

Will Increase Drainage

A rail-renewal program is generally accompanied by a ballasting program of comparable magnitude, and this calls for reshaping and strengthening the roadbed, together with considerable incidental drainage. Furthermore, while a stable roadbed has always been recognized as one of the essentials for good track and that this stability can be attained only by thorough and adequate drainage, this element of maintenance has not always been given the attention that its importance deserves. With the advent of higher train speeds, the need for better and more extensive drainage has been emphasized as never before, and this need has been accentuated still further by the increasing volume of traffic and the necessity for absolutely dependable service in the face of military requirements.

In fact, not a few maintenance officers expect that these demands for service without interruptions or delays that can be avoided, will become still more insistent in the months ahead. For this reason, ditching and other earth-moving equipment has a large place in the 1942 budgets, and it is expected that not less than 150 units, including power shovels, draglines, combination shovels and draglines or cranes and shovels, auxiliary equipment for tractors, sheepsfoot rollers and clamshell buckets for use with cranes will be purchased this year. It is also of interest that the one spreader-ditcher included in the budgets about which information was given, is the only on-track unit in this group. In addition to the types mentioned, and in line with practices that have developed in the last two or three years, a number of large-capacity earth-moving units, such as carryalls, dump wagons, wagon scrapers, etc., are also on the list for purchase in 1942.

Keeping the Weeds Down

During the depth of the depression and even after earnings began to improve, no feature of maintenance was neglected so completely as the policing of the right of way. In fact, with only a few exceptions, for several years, only noxious weeds that were required by law to be destroyed were given attention. Remembering this experience with uncut right of way, the budgets for the last three or four years have included a considerable number of weed-destroying units. In continuation of this effort to improve the appearance of their property, as well as to reduce fire risks, the budgets for 1942 contain no less than 174 weed destroying units, including weed burners, extinguisher cars, on-track and off-track mowing machines, motor scythes, discers and scarifiers, in addition to which there will be considerable chemical weed destruction.

As already mentioned, for reasons that are well understood, purchases of

automotive equipment will be at the minimum. No automobiles were included in any of the budgets and only four of the roads that participated in this survey are expecting to buy motor trucks or highway trailers. Obviously this is a reversal of the trend that has been so much in evidence for the last seven or eight years, and which has been gathering momentum year by year. It is equally obvious that if there were no restrictions on the production of this type of equipment, the budgets would have contained many highway vehicles, for the advantages of their use are beyond dispute.

Likewise, beginning about eight years ago, there was a scarcely preceptible movement toward the use of off-track equipment. For the first two or three years this practice was so novel that attention was called especially to purchases of machines with crawler mountings. First tractors, then power shovels and, finally, cranes were set on these mountings and proved to be so flexible and so able to perform work that could not be done by track-bound machines, that they gained wide favor on this basis alone. It was not long, however, before maintenance officers began to realize that they could save the cost of work trains through the use of this equipment, and this, together with the advantages inherent in machines that were under no restrictions with respect to where then could be worked, caused the movement to gather speed.

The tempo of the movement toward the general adoption of off-track designs was accentuated further by demands from train-service employees, which were upheld by the railway adjustment boards, that they be employed on all units of work equipment that could not be removed readily from the track. As a result of all of these factors, maintenance officers have found it greatly to their advantage to buy equipment on crawler mountings. Today motor cars, locomotive cranes that are moved over considerable distances from one part of the road to another, pile drivers and rail cranes are the only large types that continue generally to remain on rail mountings.

Until recently, the use of cranes on crawler mountings has not been so marked as was the case with earth-moving equipment, although the relatively few cranes on crawler mountings had shown the same advantages in mobility as other forms of equipment. The reason for this reluctance to go to crawler mountings is not difficult to see, for cranes more than most types of equipment are moved from place to place, frequently to distant points, often at a moment's notice. Furthermore, the larger machines of this type are used in bridge erection and maintenance and for other tasks that confine them to the track, while rail cranes, by the nature of their use, can be employed to better advantage when on rail mountings. However, between rail cranes and machines that must be moved on their own wheels in trains, there is a considerable range in sizes and designs, and as one indication of the attitude of maintenance officers toward off-track designs, while 86 cranes of various types and sizes, including the combination crane-shovels and crane-draglines already mentioned, will be purchased in 1942, only the locomotive and rail cranes will be of on-track designs.

Today, Grinders Are Standard Equipment in the Maintenance of Rail, Switches, Frogs and Crossings

Tie Tampers Increase

Alert maintenance officers have long recognized the waste involved in hand operations, and are eager to mechanize their operations wherever possible. While tie tampers were among the early examples of the application of power machines to maintenance, their use expanded slowly because the outfits available were too large and cumbersome for any but large gangs engaged in ballasting or in general surfacing without the application of ballast. During the period of greatest reduction in the maintenance forces at the depth of the depression, it was only through the use of tie tampers that the track was kept to the standards necessary for safe and comfortable operation. With the advent of shortened schedules for passenger and freight trains, maintenance officers learned to value mechanical tie tampers still more highly. That they are applying the lessons so learned to their current work is evidenced by the fact that the budgets for 1942 provide for the purchase of 300 tie tamping outfits, complete with power plants and tools, the largest number ever purchased in a single year.

With drastic reductions in force by all of the roads, there arose a serious need for adequate but lighter tie-tamping equipment that was suitable for use by gangs of two to four men. Almost at the psychological moment, the individual tie tamper appeared and has found wide-spread favor, particularly as equipment for section gangs. In fact, certain roads are working definitely toward the goal of providing every section with a complement of these machines. Others are also providing them as equipment for extra gangs. As a result of this favor, the budgets for 1942 provide for the purchase of 967 tampers of this type.

With the advent of the unit tampers, manufacturers began to design smaller and lighter outfits that can be used economically by small gangs. An analysis of the complete outfits that are included in the budgets develops the interesting information that a considerable number of these outfits are for the use of small gangs in ordinary maintenance. Since, as a whole, they range in size from 4 to 16 tools, and since there is a material increase in the larger sizes, compared with these purchased last year, the indications are clear that maintenance officers expect to apply more ballast this year, corresponding to the increased amount of rail to be laid. These figures compare with 226 tie-tamping outfits and 891 individual tampers purchased by the railways in 1941.

Will Buy Many Small Tools

As has been explained, anything like a close estimate of the number of small, easily-portable, hand-operated power tools to be purchased in any year is almost an impossibility, for few of the officers from whom information is received give details concerning the number or the types of these tools that they expect to buy, although a few of them do mention the types they have in mind. Those mentioned this year include wood cutting and boring tools, power wrenches of several designs, tools for cleaning and repairing structural steel, air and electric hoists and winches, clay diggers, concrete break-

ers, and sheet-pile hammers, aggregating 20 types.

As nearly as can be ascertained from the data given in the budgets, approximately 500 to 600 small tools of all types will be purchased during the year. This estimate is based partly on a comparison of similar information given in previous years with actual purchases in those years and partly on the fact that, in addition to the power plants included in the 300 tie tamping outfits, the budgets contemplate the purchase of 72 air compressors and 26 generators.

Rapid Expansion Continues

One of the striking facts connected with work equipment is the rapidity with which its use has expanded during the last decade and particularly during the latter half of this period. One needs to go back only a quarter century to arrive at a time when motor cars, on-rail ditchers, steam shovels, lidgerwoods, pile drivers, bridge derricks and locomotive cranes were about the only classes of equipment available to maintenance officers. It is true that a few other types, such as the tie tamper, were under development, but they had not gained general acceptance; in fact, many maintenance officers were quite skeptical of their value and some of them continued to be for many years. This situation stands in strong contrast with that of today, for maintenance officers are no longer skeptical, while they now have a wide variety of types from which to make selection. That they are ready to take advantage of these opportunities is evidenced by the fact that they purchased 118 different types of power machines and tools in 1940 and increased their selections in 1941 to include 152 different types.

Again, prior to a quarter century ago, labor was plentiful and wages were low, so that there was no strong economic demand for the mechanization of maintenance. However, the labor shortage and the rapid increase in wages induced by the war provided the incentive for mechanization that has continued until today. With these conditions that characterized the former war likely to repeat themselves today, probably in more severe form, there is every reason to expect still further expansion in the use of power machines and tools.

There Is a Shortage

One who cares to study the trends in the use of work equipment or to inform himself of the current situation with respect to it will discover many items of interest and value. Among them he cannot fail to note what all maintenance officers are aware of, namely, that, despite the ever-widening variety of work that is becoming mechanized, and the continually increasing purchases of power machines and tools, a real shortage of work equipment exists on every road today. While this information can be adduced from several sources, it is easily confirmed by the fact that every budget concerning which information was given us contained provision for additional units.

In other words, for more than a decade there has been inexorable pressure for greater economy in all phases of railway operation, and maintenance has in no wise escaped its share of this pressure, despite the equally inexorable demands for higher standards in the maintenance of track and structures. In large measure it has been this pressure that has broken down the skepticism of certain officers regarding the advantages of mechanization, and has dissipated the self-satisfied attitude exhibited by others who were quite convinced that there was no need for equipment on their roads, except for tasks that were too heavy to be performed by hand.

While it required many years for this evolution to occur in the outlook of some officers, others who were more forward looking did the pioneering and aided in the developments which have made possible the greater economies of today. It has been their vision and courage that have enabled manufacturers to develop the wide variety of machines and tools from which all may choose today. Yet not a few of these officers have been so deeply impressed with the "savings" they were able to effect in changing from hand to machine methods that they have lost sight of the wider field of economics in the use of equipment.

Loss Through Obsolescence

They have been aware, of course, of the advantages that have accrued from the use of work equipment when the forces were reduced below any previous level of their experience. They have also been keenly appreciative of the opportunity to obtain machines and tools when the increased rates of pay became effective a year ago, as a result of the decisions under the Wage and Hour law. The thing that has been most difficult for maintenance officers to understand, however, is the economic loss that is sustained through obsolescence. The reason for this is obvious, for there has always been so great a shortage of practically all types of equipment, that no matter how antiquated a machine or tool might be, some saving could always be effected by using it to replace a hand operation, provided it was in fair condition and safe for operation. For this reason, relatively few machines have been retired until they were worn out completely.

Aside from the question of economics, however, despite its importance, it is obvious that in the days that lie ahead every maintenance officer will be compelled by the pressure of circumstances to use every means at his disposal to do the work that he will be compelled to do and to do it to an acceptable standard in the face of a shortage of labor. This means not only that he will be dependent on his power machines and tools to an extent that he can scarcely visualize today, but he must be able to drag the last ounce of effort from them.

How Much Is Modern?

With this thought in mind and to gain some idea of the extent to which the work equipment owned by the railways is afflicted by obsolescence and wear, every maintenance officer from whom information was sought, was asked how much of his equipment is nearing the end of its life and how much is not modern. In previous years only an occasional road claimed that all of its equipment was modern, although some others said that they were endeavoring to replace all obsolete units with modern machines, and the outmoded equipment on individual roads has ranged from 10 to 90 per cent. It was no surprise, therefore, that the answers this year also covered a wide range, despite the active buying that has characterized the purchase of work equipment during the last eight years, although this range was somewhat more restricted than in former years.

This year as in previous years, only a few roads were willing to admit that they have any obsolete work equipment although willing to admit that some of it is not modern, and most of them said frankly that many of the machines included in their budgets were for the replacement of old machines. Some apparently have the point of view expressed by one officer who said that "so long as we can keep a machine in good running order at reasonable expense, we do not consider that it is obsolete." It is obvious that the heavy buying of work equipment that characterized 1941 could not fail to have some effect on the number of outmoded units in service, and this is confirmed by the fact that no road reported more than half of its equipment as not modern, with most of them ranging from 25 to 40 per cent.

As has been shown, on many roads a machine may be far from modern and yet may not be considered as

either obsolete or as nearing the end of its service life, if it can be kept in reasonably good operating condition. The replies to a question on this point indicated that from 5 to 25 per cent, but averaging around 10 per cent, of the equipment now in service is approaching the end of its life.

Continuing Expansion Sure

All of the evidence presented by the roads themselves, as well as consideration of the demands that will continue to be made on the maintenance forces, and the probability of still further depletion of available labor, point to a continuing expansion of the use of work equipment as far in the future as it is possible to foresee, so that there is no tangible evidence that the point of saturation in the use of work equipment will be reached in the predictable future. This is a point upon which maintenance engineers have often expressed concern, on the ground that when the point of saturation is reached designs will freeze, because, by reason of the restriction thus placed on the market, the manufacture will have no further incentive to improve his products. Motor cars present the best refutation of this argument, for there has been practically no expansion in the use of motor cars for 20 years; yet the demands for replacement of worn out and obsolete units provide the same incentive to the manufacturer to improve his product as he had when the market was expanding.

War Conditions a Factor

Obviously, the basic advantages of work equipment have not changed but are the same today as they were a decade or two decades ago. Yet the conditions under which they will be used during the next few years are likely to differ from anything within the experience of any maintenance officer. At the depth of the depression most of the officers in this department thought that rock bottom had been reached with respect to the size of the maintenance forces. At that time, however, traffic had fallen off to a remarkable extent. During that period, also the old standards of track maintenance and track excellence were still in effect. It was only through the intensive use of work equipment that it was possible to maintain the railways under the conditions thus imposed.

Tomorrow, the conditions may be less favorable; less men may be available, many of them past their most active years, to maintain the tracks and structures. Traffic is likely to be at record volume; and speeds are sure to increase rather than to slow down. In the face of these less favorable conditions, maintenance officers must develop still higher standards of maintenance for both track and structures.

This is not intended to be a pessimistic view of the future, but a suggestion of what is ahead, which can be seen by anyone who is willing to face the facts. If it be so, then the important question is, what can be done about it. Obviously, man power is not the solution of the problem, for this will not be available. During and since the depression, work equipment has demonstrated its ability to tide over shortages in man power, as well as to supplement the maintenance forces under favorable conditions, and to accomplish tasks that could not otherwise have been accomplished. It seems certain, therefore, that the all-out war effort toward which this country is building will not curtail expansion in the use of work equipment, but that rather it will tend to stimulate it.

Pennsylvania Announces Track Awards for 1941

Following a practice of long standing on the Pennsylvania, letters of commendation have been sent to those supervisors of track whose territories were maintained to the highest degree of excellence in 1941. During the year, periodical inspections were made by special track inspection committees headed by the chief engineers maintenance of way of the respective regions. In these inspections the various supervisors' territories were rated for line, surface and general improvement, and the letters of commendation were sent by their superior officers to the supervisors whose territories received the highest ratings. Following are the names of the supervisors and their assistants (where they have assistants), whose territories received special commendation:

New York Zone—New York division—C. E. Gipe, New York, and C. L. Towle (assistant). Long Island railroad—Lee Spencer, Jamaica, L.I.

Eastern Region—Maryland division, main line—H. L. Byrne, Washington, D.C., and W. W. Worthington (assistant). Maryland division, branch line—L. H. Miller, York, Pa. Middle division, main line—W. C. Gretzinger, Newport, Pa., and L. F. Shields (assistant). Middle division, branch line—D. M. Howard, Hollidaysburg, Pa. Philadelphia to Harrisburg, main line—J. H. Kerchner, Lancaster, Pa., and Norman Olsen (assistant). Philadelphia division, branch line—C. F. Parvin, Enola, Pa., and H. D. Sipe assistant). Philadelphia Terminal division—L. W. Green, Philadelphia, Pa., and J. E. Chubb (assistant). Delmarva division—D. W. Force, Harrington, Del. Williamsport division—F. H. Lewis, Northumberland, Pa. Wilkes Barre div.—S. M. Rodgers, Reading, Pa.

Central Region—Best of all supervisors' subdivisions—J. P. McGhee, Coshocton, Ohio. Eastern division—C. P. Sipe, Pittsburgh, Pa. Pittsburgh division, main line—G. M. Sauvain, Trafford, Pa. Pittsburgh division, branch line—M. J. Miller, Cresson, Pa. Conemaugh division—W. J. Gilbert, New Kensington, Pa. Monongahela division—R. G. Davis, Shire Oaks, Pa. Buffalo division—R. J. Smith, Dunkirk, N.Y. Renovo division—I. S. Pringle, Emporium, Pa. Panhandle division, branch line—A. C. Haines, Zanesville, Ohio. Cleveland division—J. W. Buford, Akron, Ohio. Erie and Ashtabula division—J. C. Dayton, Sharon, Pa.

On the Western Region

Western Region—Chicago Terminal division—W. P. Conklin, Colehour, Ind. Fort Wayne division—Geo. Baylor, Crestline, Ohio. Logansport division—John Nowviskie, Crown Point, Ind. Toledo division—Darel DeVore, Marion, Ohio. Grand Rapids division—H. B. Sutherlin, Grand Rapids, Mich. St. Louis division—J. F. Piper, Terre Haute, Ind. Indianapolis division—J. B. Hill, Indianapolis, Ind. Columbus division—J. M. Collins, Columbus, Ohio. Cincinnati division—W. R. Garner, Cincinnati, Ohio.

In addition, the track foremen whose territories were maintained to the highest degree of perfection on the respective supervisors' sub-divisions were commended by the division superintendents.

Labor—
In a Period of
Widespread Industrial Activity

Fred S. Schwinn

With labor equally as important as equipment and materials in the efforts of maintenance men to meet the enlarging demands that are being made upon the tracks and other fixed structures of the railways by our country's huge war efforts, the two papers presented herewith, the first by Fred S. Schwinn, assistant chief engineer, Missouri Pacific Lines, before the Roadmasters' association, and the second by P. O. Ferris, chief engineer, D.&H., before the American Railway Bridge and Building Association, are particularly timely

TODAY we face and must find the answer to the problems of what to do to meet successfully the growing general demand for labor, and more labor, and of adjusting ourselves to the present and future conditions resulting from the national emergency. At the same time, we must also meet the greater demands on the railways growing out of that emergency.

Just where the American railroads must stand in this emergency is not difficult to visualize. They must carry by far the greater burden of the increased transportation requirements. As such, they may be considered to constitute a major defense industry. Munitions plants, ordnance depots, in fact, every unit of our rapidly growing and expanding defense machine, would be handicapped seriously by a breakdown of the railroad transportation system. Therefore, it is very apparent that the railroads must be operated both safely and efficiently—more so now than in normal times.

Maintenance Men in Demand

The present shortage in industrial labor, already reaching serious proportions in some localities, is brought about by the demand for experienced men in all lines of endeavor related to our tremendous defense program. The curtailment of non-defense activities resulting from the diversion of certain raw materials to strictly defense requirements will, unquestionably, relieve this situation to a large extent. But many manufacturing industries, fabricating plants and shipyards are asking for the services of our gas and electric welders, because they are experienced. The construction industry welcomes the services of our foremen, because they have the ability to handle men, to organize their assigned tasks, and to carry out instructions satisfactorily.

Your machine operators are in demand, not only by industry generally, but by the army. The army has great need for trained operators and mechanics in the development of its mechanized divisions. The fully-equipped engineer battalion as at-

Power Equipment and Tools Will Reduce Man-Hour Requirements Materially and, in Many Instances, Will Produce More Permanent Results

Addresses By

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and

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P. O. Ferris

The Need for Mechanized B. & B. Forces Is More Urgent Today Than Ever Before

tached to a combat division has almost the identical machines which you use daily in track maintenance, including draglines, bull graders, air compressors, electric power generators, earth augers, concrete breakers, and a large number of similar units—as well as a large amount of miscellaneous equipment for constructing bridges, buildings, water pumping and purifying plants, and other facilities needed for the movement and well-being of the troops.

Your laborers are also in demand, by both industry and the army. They are of great value in labor battalions because they have been trained to work. Both the army and the navy are aware of the relative value of trained and experienced workers in both skilled and unskilled fields, and that the railroads were one of the few industries that maintained a reasonable personnel of both during the depression years. The army recently activated a railroad battalion to serve as an example for the organization of other similar battalions of trained railroad men who would be available for the maintenance and operation of railroads as needed in hemispherical defense. And the majority of the men assigned to such a battalion, equalling the organization of a railroad division, are maintenance men.

These are but a few of the many influences tending to draw labor away from the railroad ranks because of the requirements of expanding defense industrial activity and the necessity for developing suitable personnel for our enlarged defense army. You are not unwilling to release those men who are needed and who must be released to man the defense machine of our country adequately. But, with the responsibility that rests upon you, what can you do to meet these conditions, and yet maintain properly the property placed in your care? You must be prepared to meet satisfactorily the increased load that is being placed upon your tracks. You will be called upon to rehabilitate tracks which were removed from service during recent years, and to restore them to service. To carry on successfully will require every bit of your ingenuity.

Careful Planning Essential

Probably more can be done through careful planning of program work than by any other single means. Track work should be spread as uniformly as practicable throughout every working month of the year, and all work which may be performed satisfactorily in the winter months should be assigned to those months, with the object of using a stable force throughout the year as nearly as possible. It is entirely practicable to minimize peak labor requirements to a considerable degree, and this should be done. By further planning, you may be able to meet imperative peak requirements by taking advantage of idle farm labor. Such labor may also be drawn upon to mow your right-of-way and to perform similar tasks.

You can scan your maintenance programs further with the view of reducing the amount of work to be done to not exceed that actually now needed. The course of least resistance might be to say that the rail ends throughout some stretch of track need building up, and to order out-of-face operations. By careful inspection, you may find that only half of the rail ends show sufficient batter to warrant immediate attention. If that is the case, you can reduce your labor requirement nearly one-half by adopting spot welding.

Adequate supervision can do a great deal toward minimizing labor needs. As in the case of building up rail ends that are not battered sufficiently to warrant that attention, we have all seen ties removed from track which were not in need of removal at the time, or possibly we have seen a gang "grassing" track only a week or so before a ballast discer or scarifier was to operate over the territory. Such situations must be corrected by intensified or additional supervision. Supervision, with many other elements of maintenance, was reduced during the depression years, with their decreased requirements. With the present upturn in traffic, some additional supervision may be required.

Equipment Will Aid

Generally, our use of roadway machines has been accelerated by the necessity of offsetting, so far as possible, the rising cost of labor. In other words, the cost of equipment might not have been justified when compared with low labor rates; but as those rates have advanced, the use of labor-saving machines has become more and more attractive and economical. We have found that these machines reduce our man-hour requirements materially and, in many instances, will perform the required work more thoroughly than can possibly be done by hand.

Each year brings new developments and improvements in roadway machines. The evolution of the last 10 or 12 years in this field has been remarkable, and we can now perform many tasks by machine which, only recently were strictly hand-labor problems. We are also learning more about how to maintain these machines in order to secure the greatest number of machine-days per working season or per year. Every now and then one of you will develop a new method of using an old machine, either by itself

or in combination with some other machine, which will increase its output. Furthermore, realizing that an idle machine is not a productive investment, we find it highly advantageous to program the operation of every machine on our properties.

Correct Abnormal Conditions

In addition to the possibilities of mechanization, you should look for and report any conditions which are forcing you to use an abnormal amount of labor. Do you have some place where your gangs are spending considerable of their time straightening and respiking ties that have been skewed by creeping rails, or in driving those rails back to redistribute the expansion gaps? Possibly a few additional rail anchors might eliminate this waste of labor. Or possibly you should direct the attention of your management to some unsatisfactory embankment condition which should be corrected by drainage or stabilization, and thereby save many hours of track labor annually. These are only examples of what you must always be looking for, and which are much more important under a heavy-traffic load than they were under normal conditions. There is one thing that the roadmaster never can be—he can never be satisfied; and that observation is particularly true in its labor aspects.

During the World war we found it necessary to raise our age restrictions in order that we might secure the added labor we needed, and, in a few instances, it even became necessary to employ women temporarily for track work. Our present defense effort far exceeds that of 1917 and 1918, and it is entirely possible that to meet successfully the greatly enlarged traffic load which we can expect, we may be forced again to resort to similar means to supply our labor requirements.

I have cited only a few of the many ways in which we can meet our labor requirements and offiset the effect of the rapidly growing demands for labor by those industries which are engaged in defense activities. I have not undertaken to go into detail or to suggest which steps should be undertaken first. Local conditions and requirements must decide these matters. The responsibility of maintenance is yours; the problems to be met and overcome are yours; you will receive little help, but you have the advantage of your past experience. You have done it before; you can do it again.

The Best of Our B. & B. Labor Can and Must Be Held Intact

By P. O. Ferris

Chief Engineer,
Delaware & Hudson, Albany, N.Y.

THE problem of maintaining forces is always serious and important, but it is especially so in a period such as we are facing today. We are now passing, or have passed, from a period of major depression to one of prosperity, or almost complete recovery.

This recovery of business has come about not because of re-adjustments in industry due to changes in methods of production, nor to changes in transportation, manufacture or merchandising. It is true that all these have played an important part, but the real cause is the stimulation of business due to the present war. This war stimulus has created demands calling not only for the expansion of present industries, but also requiring the creation of many new ones. The problems of production and transportation today are more numerous than ever before, and their solution requires the utmost effort on the part of capital, management and labor.

Without Modern Rail-Laying Equipment, the Railways Would Face an Almost Impossible Task in Their Rail Renewal Programs

A short time ago I saw some very interesting data. These United States of ours hold an enviable position in the world. They provide nine-tenths of everything we need. Most of what is imported may be considered luxuries. Here, we have 6 per cent of the population of the world and less than 6 per cent of the land area, and yet we produce 72 per cent of the world's supply of oil, 37 per cent of the coal, 42 per cent of the iron ore, 45 per cent of the finished steel, 51 per cent of the copper, 54 per cent of the cotton, 64 per cent of the corn, and 20 per cent of the wheat.

I do not know the date these figures were compiled, but I do know that it was prior to 1941. Large as this production cited is, I have reason to believe that it has increased considerably, since we are now trying, as never before, to furnish ourselves and the rest of the world with munitions and other supplies. In view of this, is it any wonder that we are confronted with a labor problem?

Industry Seeks Our Men

The railroads are the prey of almost everything under the sun: Depression, diversion, taxation, regulation, subsidized competition and politics. In addition, in times like these, they are the prey of other industries, especially defense industries, for their skilled labor. Most classes of the skilled labor demanded by other industries are to be found in the bridge and building departments of the railroads.

The railroads have between four and five billion dollars invested in their bridges and buildings. Normally, more than 100 million dollars are spent annually on their maintenance. The proper organization and retention of the skilled forces in the bridge and building department are, therefore, matters of considerable financial importance to us all. The workmen in these forces may be divided into three groups:

(1) Those exceptionally satisfactory, which, if lost, are hard to replace.

(2) Those sufficiently satisfactory to be retained, but not hard to replace.

(3) Those of undesirable character, poor or unstable habits, and discontented minds, who are trouble-makers.

Those in the last mentioned group

are tolerated only until their traits are discovered, or during times of great industrial activity.

How Can We Hold Best Men?

How can we secure and hold men of the type in the first group, and guard against men of the type included in the last group? I believe the solution lies in reducing our forces to a point so small, consistent with proper maintenance, that those retained can be employed continuously, the year around—a force so small that it will be unaffected by financial reverses.

How can this be accomplished, and yet maintain our structures properly? It can be done by removing unnecessary structures; by building for permanence; by mechanizing our forces wherever it is economical to do so; and by contracting our major projects.

A careful study of our properties will reveal numerous structures of various kinds that are unnecessary, or structures that can be made unnecessary by combining their functions with those of others. Starting in 1922, such a study was made on the Delaware & Hudson, which resulted in the abandonment of 47.8 per cent of our freight and passenger stations, 32.1 per cent of our water stations, 36.8 per cent of our turntables, and 36.4 per cent of our other miscellaneous buildings—a combined total of 37.3 per cent of all such structures.

I do not have to tell you what can be done regarding more permanent construction in railroad work. Briefly, it involves using the best materials available, consistent with the expected life of a structure. The initial labor cost to install good materials is little, if any, more than the cost of installing poor materials, but the resultant saving in maintenance labor is considerable.

The subject of the mechanization of bridge and building forces was handled very ably in a report of one of your committees last year. I shall not attempt to enumerate the various units of labor-saving equipment and power tools that are now available for mechanizing bridge and building forces. However, the necessity for this mechanization to augment the production of your present forces is more urgent today than ever before. If those in the bridge and building department are equipped properly, regular or ordinary maintenance can be handled satisfactorily with a minimum force.

Projects of major proportions should be contracted. With proper specifications and, of course, efficient inspection, the work on such projects can be completed with entire satisfaction. By so doing, the regular forces can carry on without interruption, and without deferring ordinary maintenance.

Stabilize Forces

From what I have said, you will sense that I am advocating what is, in reality, the stabilization of bridge and building forces, and have suggested a method of accomplishing it. With regard to the stabilization of forces, I can refer proudly to the originator of that system on the Delaware & Hudson, the late H. S. Clarke, engineer, maintenance of way, with whom I had the honor to be associated for many years. I have tried to continue many of his maintenance policies, and the stabilization of forces is one of them.

We have had very little trouble keeping our bridge and building forces stabilized. We have a bridge and building department on each division under the supervision of a bridge and building master, or supervisor, who reports to the division engineer, who, in turn, reports to the chief engineer. In addition, we have a system steel bridge department, a system, and not divisional department, under the supervision of a general foreman, who reports direct to the engineer of structures, who, in turn, reports to the chief engineer.

Our steel bridge department, which includes a small shop gang and two fair-size road gangs, is equipped with a small, well-equipped shop. The road gangs are housed in exceptionally comfortable camp cars and cover the entire system. They work on steel alone, and are equipped to take care of all steel maintenance work, as well as the erection of new bridges, if required. We, however, contract major bridge erection jobs. There has been no change whatever in the personnel of this department for more than 12 years.

The division bridge and building department forces, although stabilized, have been reduced approximately 30 per cent as the result of abandonments, careful planning of work and mechanization, and by con-

Power Tools Will Offset Losses in Labor and, at the Same Time, Effect Substantial Economies in Doing Work

Record of Service of Bridge and Building Foremen, Skilled Workers and Helpers on the Delaware & Hudson

Foremen

(Foremen are promoted from the ranks)

Service Record		Ages	
Youngest in service	3 yr.	Age of youngest	39 yr.
Oldest in service	41 yr.	Age of oldest	66 yr.
Average	20 yr.	Age of average	54 yr.

Skilled Workers

Youngest in service	2 yr.	Age of youngest	29 yr.
Oldest in service	43 yr.	Age of oldest	67 yr.
Average	16 yr.	Average	46 yr.

Helpers

Youngest in service	1 yr.	Age of youngest	32 yr.
Oldest in service	22 yr.	Age of oldest	58 yr.
Average	14 yr.	Average	41 yr.

The average age of all bridge and building employees is 45 years.

tracting major projects. I believe that now, however, through the addition of more power tools and equipment, we have a minimum force consistent with average maintenance.

Long Service Records on D. & H.

Most of our bridge and building employees have been with us for many years, as will be evident from the accompanying table.

From these tabulations, it is seen that we have had little, if any, trouble in maintaining the bridge and building forces on the Delaware & Hudson. We have several major defense industries on our lines and numerous other industries, but, in spite of this, I am able to state that, to date, we have had no losses which could not be replaced. There must be some reason for this.

Steady Employment Desirable

There is something fascinating about railroad work, regardless of the department. All of us, no doubt, have had attractive offers to leave our railway at one time or another and have turned them down, or, if they were accepted, have returned to railroading when the opportunity presented itself. Some of our workmen, no doubt, were attracted to railroad work because of this fascination, but most of them entered railroad employment because of many other reasons.

One of the drawbacks to securing and retaining good skilled employees is the uncertainty of steady employment. Although it may be necessary to reduce forces at times during the winter months, a reputation should be established for employing an average force the year around. Bridge and building work can be so planned that it can be distributed over the year with efficiency and economy. Work such as the painting of the interiors of buildings, repairs to freight house, shop, and enginehouse floors, and many other interior repairs, can be done satisfactorily in cold and inclement weather. Therefore, get a reputation for providing year-around employment.

The building industry and many manufacturing industries do not have such a reputation and, although their hourly wage may be higher than that on the railroad, the average employee, in the last analysis, is concerned primarily with the amount of regular pay on which he can depend.

If possible, hire men from the smaller communities, rather than from the cities. Men in the smaller communities have usually learned how to work. All that is necessary is to train them. Wage rates and the cost of living are lower than in the cities, and railroad labor rates are, therefore, attractive in comparison.

When men are away from home, provide them with good living quarters, and permit them to return to their homes over week-ends. On our railroad, we provide camp cars equipped with lighting and heating systems and a fully-equipped kitchen and dining room. Sleeping cars and bedding are provided for the workmen, dormitory style, with separate quarters for the foremen and the cook. Shower baths are also provided by means of a small converted locomotive water tank.

The foreman is in complete charge of the camp and is responsible for the cleanliness of the cars and the conduct of the men. The cost of meals is divided equally among the men and they all have a voice in what will be served. Camp living expenses are thus, very small. We permit the men to go home week-ends, and any time that is lost as a result, is made up by working extra time on regular work days.

Use care in the selection of your men, not only from the standpoints of age, health and physical qualifications, but also from those of character and disposition. A man of poor character, or one with a disagreeable disposition will, sooner or later, become a trouble-maker and spoil the discipline of an entire gang. Having once hired a man of this type, he is hard to get rid of—so choose your men with care.

Create a first-class safety-first organization. Have as many men as possible take an active part in it. Hold periodic scheduled meetings. Invite different foremen and men to attend. Have safety agents contact the men at work occasionally for short safety talks. Inspire your regular men and your prospects with the fact that employment in a bridge and building gang is safe employment.

Have a standard and fair discipline system, uniform throughout the entire railroad. This will assure that all of the men are treated alike, and will aid you in retaining your regular men and in attracting new men. It will also prevent many claims on the part of the labor organization.

Select Officers Carefully

Choose supervisory officers and foremen with reputations for experience, intelligence, and unquestioned disposition and character. The abuse of employees by officers or foremen should not be tolerated. Good men will endure it only under circumstances that compel them to. They will not endure it when employment is open elsewhere. If your road gets a bad reputation in this respect, it will be not only hard to retain men, but just as hard to hire new men. If you have supervisory officers who abuse their men, their services should be dispensed with, because they can be very damaging to the company's interest. You must have supervisory officers whom workmen respect.

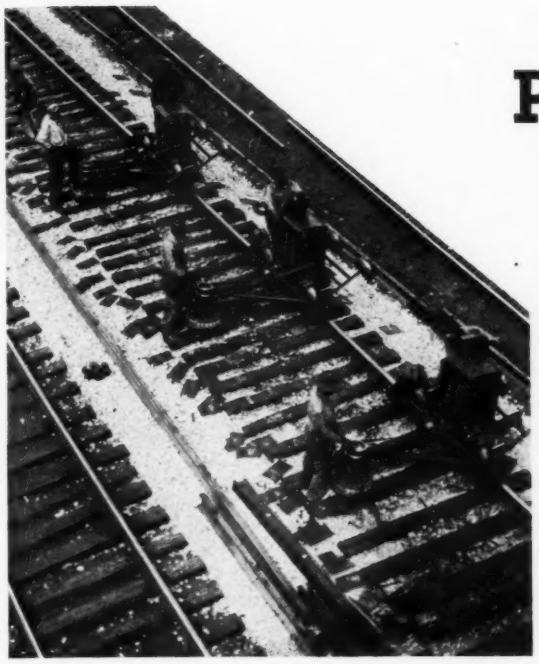
Promote foremen, and at least some of your supervisors, from the ranks. Let your employees know by this action that there is a chance for their advancement; a premium for faithful and efficient service. Furthermore, supervisors should have personal, frequent, and friendly contact with their men.

It is an easy matter to impress men with the advantages of railroad employment. Men get a great deal better training in railroad work than they do in ordinary industry. They have an opportunity to see and do more special kinds of work under a wide variety of conditions. The work, generally, is not hard. There is, almost daily, travel time (at company expense) free from manual effort, as contrasted with similar positions in outside industries where a full eight hours of productive labor is expected, doing the same thing day after day. There is something new and different almost every day in the work of a railroad bridge or building crew.

Railroad work is healthy and safe. There is the opportunity for railroad workmen and their families to travel by rail at no expense. They are protected in old age by pensions. Although the work is seasonal, there are no drastic reductions of forces as in the building industry. The workmen we desire to hold can be convinced that the working conditions and high wages being created in other industries at the present time are artificially maintained, and are of uncertain and, perhaps, short duration.

If this is brought to their attention, your men will recall the past years of unemployment and the many victims of the depression. They will recall the financial reverses that are bound to follow such periods as the present. They can be told that railroads have a record of steadiness. Business, at present making steady advancement, may suddenly stall. The railroads, like the rivers, go on forever. The type of workmen we desire to hire and to keep can be convinced, regardless of other demands for their services.

We are now all being put to the test, and remember that one test of executive talent is the ability to secure and retain the services of satisfactory employees.



The Adzing Machine Marked a Great Advance in Rail Laying

Power Equipment Wins Larger Place On the Big Four

By C. W. ENGLE

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In a paper, presented before the Association of Maintenance of Way Foremen of the Big Four Railroad, the author points to the development and increasing acceptance of mechanical units for maintenance work on this road and offers a number of suggestions for increasing their efficiency and reliability

C. W. Engle

POWER-driven devices have come into use during the working lifetime of all of us. They have come to stay and in the years to come better machines and more of them will be made available for our use. Our problem is to learn how to get the best results from these various machines and its solution is to know, from both study and experience, the proper method of using them and how best to keep them running.

The majority of the track machinery now in service employs internal combustion engines, using gasoline as fuel. They usually drive the tool either through a clutch or direct, although some use auxiliary power, such as an electric generator or an air compressor. The gasoline engine, being the source of the original power, holds first place in our attention.

The Gasoline Engine

The gasoline engine has developed in our time from a crude to a highly efficient source of power, which, with a comparatively small amount of attention, will give good results. The gasoline engines we use are built in two types, two-cycle and four-cycle, and, so far as we are concerned, the principal difference is in lubrication. In the two-cycle type the lubricating oil is mixed with the gasoline before being poured into the supply reservoir, (never use less than ¾ pint of lubricating oil to a gallon of gasoline) while in the four-cycle type the lubricating oil is poured into the crankcase of the engine. On most engines one will find a manufacturer's tag, giving instructions as to the weight of lubricating oil to be used in that engine in summer and in winter. These instructions should be followed closely. In the four-cycle engine, the oil in the crankcase should be checked as to quantity and condition and should be changed whenever it becomes black in color.

The spark plug plays a very important part in the proper operation of a gasoline engine and in the case of engine failure it is one of the first parts to examine. Remove the plug and examine it for cleanliness, remove carbon with a pocket-knife and check the spacing of the points. If the foreman is not equipped with a "feeler gage," a simple and very satisfactory method of spacing is to use a thin dime as a gage for setting the point. Where dry cells are used for ignition, the wires connecting them should be examined to ascertain that all connections are tight; water and dirt on these wires often cause ignition failures.

Many engines are equipped with a strainer and water trap bowl designed to be removed and cleaned easily. In case the engine is not equipped with a strainer bowl, the gasoline supply line is equipped with a union at the carburetor, which can be disconnected and the gasoline line flushed out, being careful not to allow the gasoline to flow on the hot engine. Sometimes the carburetor is dirty and most carburetors are equipped with a pet-cock at the bottom, which, when opened, allows the water and sediment to run out. The magneto-type of ignition is more complicated and, as a rule, when this part is at fault, a foreman had better telegraph his supervisor to send a motor car repairman.

Water and Air-Cooled Engines

We have both water-cooled and air-cooled engines. In the water-cooled type it is important to know that the radiator is always full of water. The setting of the timer or distributor, which controls the timing of the spark, is rather complicated and when this is at fault, it is best to telegraph the supervisor for a motor car repairman. Most of our motor car engines have a manually-controlled spark and gasoline control. The spark

control should be retarded when the engine is cranked or started and advanced as the engine increases speed. Under heavy pull the spark should be retarded to avoid spark knocks and overheating of the engine and to obtain greater power from the engine. Many of the new engines have an automatic spark control, or automatic governor, which controls the advancement and retarding of the spark timing automatically.

The carburetor has a manually-controlled device for the mixture of gasoline and air, which control is governed by the needle valve. As a rule, a man can tell the most efficient point at which to set this control and after it is so set, no attention need be paid to it.

We have been using the gasoline engine-propelled motor car for 20 years or more, and from continued use and experience we have learned to handle it without much worry. Other gasoline engine tools are new to us and we are still in need of further education.

The Bolting Machine

Most of you have used the bolting machine. This tool is equipped with a four-cycle, single-cylinder, air-cooled engine, controlled automatically as to both gasoline supply and ignition timing. This machine is equipped with a plate clutch, tension on which is controlled by the weight and lever principle. The lever is graduated and the weight is set to these graduations to provide various tensions for the tightening of the track bolts, the principle of this design being that when the bolt is tightened to the set tension, the clutch will slip and cease to tighten the bolt. We have discovered from experience that there is quite a difference in tension in this machine with the same setting on the lever bar. This is due to several causes—the two principal ones being the condition of the clutch and weather conditions. In view of this variation, it is best for the foreman, when using this machine, to check the tension on the bolts by having a man use an ordinary 36-in. track wrench on the bolt. He should tighten the nut with the track wrench until it cannot be tightened any more without extra effort and then the bolting machine put on the same nut and so adjusted that it will not tighten the nut any more.

A very important consideration in the use of this machine is to be very careful when applying the socket to the bolt to see that there is plenty of clearance between the top of the tie and the bottom of the socket so that the socket will slip on the nut without being cramped. Lack of clearance is more prevalent on rail-cut ties and these ties should be adzed to provide the proper clearance.

This machine is equipped with a reverse gear, so that the bolts can be loosened as well as tightened. It has two sockets—one for high speed and another for low speed, the gear ratio on the low speed being designed to give a higher tension on the nut than the high speed at the same clutch slippage point. We have found that two men assigned to this machine operate it at its highest efficiency.

The Tie-Boring Machine

The four-hole type tie plate, where two spikes are driven as anchors, has brought the boring machine into use. This machine is equipped with a four-cycle, single-cylinder, air-cooled gasoline engine, designed to operate the same as the engine on the bolting machine, except that there is no clutch. The engine drives a spindle, in which a bit is inserted, which bit, in turn, bores the under-sized hole for the driving of the anchor spikes or setting of lag screws. Attached to the spindle of this machine is a control for governing the depth of the hole to be bored. We find that two men can operate this machine at its greatest efficiency.

Motor Car Engines, Like All Other Types of Gasoline Engines, Must Be Given Adequate Attention to Insure Trouble-Free Efficient Operation

Both of the machines are affected adversely by inclement weather and should be taken to the car-house or put in the tool box at night for protection against bad weather, as well as against right-of-way fires and theft. On the Indiana division we had an engine stolen from one of our machines and in another case a right-of-way fire ruined an engine.

The Tie Tamper

In tamping ties by machinery, we are using a compressed air tamper and a unit gasoline engine tamper. The first drives a number of air tamping machines, with the air supplied from a gasoline-driven air compressor, from which pipe lines convey air to the various tamping tools in use—as many as eight.

The unit tamper is complete in itself. The gasoline engine is mounted on a drive shaft, the explosions of the engine or travel of the piston supplying the impulse to the tamping blade. The machine has a dry battery enclosed in a box, which box is designed so that it can be dragged along the track.

Both the air and the unit tampers employ the same principle, that is, a rapid series of blows transmitted through a tamping blade, which, in turn, tamps the ballast under the ties. Both machines do more uniform tamping than the hand shovel or pick method, resulting in better riding track with less physical effort.

Our rail laying gangs are becoming more mechanized each year. On the Big Four we are using bolting machines for removing and applying nuts; adzing machines for planing or adzing ties; a crane for unloading and loading rail from cars and laying the rail, and power tamping machines in the surfacing gangs following the rail-laying gangs. Boring machines bore the holes for the anchor spikes; a power drill bores holes in the ball of the rail for the bond wires and power track drill bores track bolt holes in the rail.

The Adzing Machine

The use of the adzing machine marks the greatest advance in the laying of rail that we have experienced in years. The machine is powered with a gasoline engine driving through a belt to a shaft, to which is attached a removable adzing head or bit holder.

The Road's Rail Laying Gangs Have Become More Fully Mechanized Each Year

These heads are readily removable and should be replaced whenever the bits become dull. A bit grinder, gasoline engine-powered, is furnished and it is the duty of the man in charge of the gang to see that he always has plenty of ground or sharpened bits. The head revolves in a circle parallel to the top of the tie. The operator of the machine, in turn, lowers and raises the adzing head so that all loose wood and high shoulders are planed off, providing a smooth surface for the setting of the tie plate.

One very important detail in connection with the operation of this machine is to check the level of the adzed surface of the tie at least twice a day and particularly after changing from one weight of rail to another. The machine is provided with an adjustment for this purpose. The ballast should be prepared in advance for the use of this machine by raking it down between the ties to a level at least two inches below the top of tie.

Another important item is to have all old spikes and spike stubs removed or driven well down into the tie after the old rail is released, to avoid the adzing bits hitting and tearing out pieces of old spikes. Owing to the high speed of the adzing head, it is extremely dangerous for a bit to tear out an old spike, as it throws it at very high speed and the flying spike will injure a workman who may be in line with the flying spike.

We have been using three adzing machines in a gang of 100 men, the first and second machines taking off the heavy cuttings and the third machine bringing the tie surface to a smooth plane.

The Indiana division now has a crane powered with a high-power gasoline engine. The machine weighs about 15 tons and runs on a four-wheel truck. It also has a four-wheel double-flange transverse truck which is used to move it at right angles to the main track so that it can be set in the clear for parking or clearing trains. The machine is provided with a set of rails, which are laid on a set-off which can be built of old ties. The time consumed for setting off or putting the crane on the track is about three minutes.

This machine has a 40-foot boom with a lifting capacity sufficient to unload large rip-rap or to pick up a 127-lb. frog and run with it. Its principal use in the rail gang is for laying the rail, which it does quickly and safely. It is also used for setting other track laying machinery on and off the track and for loading it on and unloading it off cars. Next to the adzing machine, this machine has permitted the biggest improvement in rail laying that we have made in our gangs for a long time. The crane is in charge of a regularly-assigned operator, who is responsible for its care and maintenance.

The Weed Mower

We now have several of the latest type weed mowers on the Indiana division and I understand that the other divisions have also been equipped with these machines. The mowers are powered with two four-cycle air-cooled gasoline engines, so located that each engine drives a cutter bar by means of V-belts and pitman rods. This engine is high-speed, powerful and automatically controlled when operated. It is also provided with a manual control for idling. Each cutter blade is operated independently of the other and can be lowered, raised, extended or drawn in—the first two operations by means of a hydraulic jack and the last two with a large wheel working through gears and ratchets. These various operations can be made without stopping the cutter bars, although a clutch is provided to throw the cutter bars to an idle position. The cutter bars, one on each side of the machine, are 6 ft. long and can be extended up to another 6 ft. so that a swath from 6 ft. to 12 ft., measured from the nearest rail, can be cut.

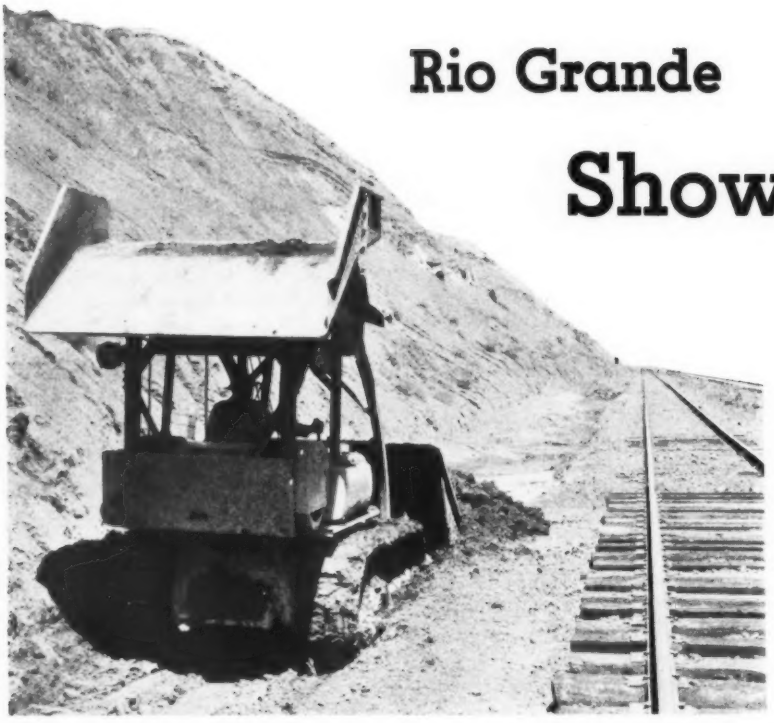
The machine has a hydraulic turntable attached to the car frame or chassis so that it can be easily jacked up to run off at a car set-off or in the reverse direction. The cutter bars are attached to the machine in such a manner that when they hang up on an obstruction, they swing to a position parallel with the center line of the machine and, after passing the obstruction, swing back to their cutting position automatically. The machine is towed along the track by means of a motor car. It requires two operators on the mower, each operating a blade, and a third man operating the puller motor car.

Both of our machines have experienced very heavy cutting; in fact, on the minor divisions they have cut brush as big as two inches in diameter, in addition to an exceptionally heavy growth of weeds, and although we have averaged only about six miles per day, I believe that with the better cutting provided by previous work, the machines should cut eight to ten miles per day.

Each machine came from the factory equipped with a hand grinder for sharpening cutter blades. I saw the need for a faster sharpener and pointed it out to our shop foreman. He developed a belt-driven sharpener, using one of the mower engines as power, and we now sharpen 24 blades or cutters in 10 minutes, whereas formerly it took two men 45 minutes to sharpen the same number and they were tired at the end of that time.

Two Men Assigned to This Machine Operate It at Its Highest Efficiency

Rio Grande Shows the Way



Units Such as This Loader Have Demonstrated Their Merit So Clearly That They Are Being Used Extensively in Cut Cleaning and Widening Operations

To those who seek the answer with regard to the adaptability and economy of off-track work equipment, especially for the wide range of construction, routine maintenance and emergency grading operations on the railways, this article, discussing the practices and experience of the Denver & Rio Grande Western, will be of interest. It points out, to an extent not generally appreciated as yet, that in the proper use of this equipment there lie large savings in lower unit costs, in the elimination of work-train expense, in the avoidance of interference with revenue traffic, and in effecting rapid restoration of damaged lines from any cause.

FOR those who question the advantages of off-track work equipment for ditching, widening banks, sloping right-of-way, clearing slides, filling washouts and other general grading operations, the answer is to be found largely in what is being done with this class of equipment on the Denver & Rio Grande Western, which, significally enough, traverses a rough mountainous territory where off-track units are generally conceded to be operated at a disadvantage as compared with work in open country.

Beginning its purchase of off-track equipment in 1937 with four 1¼-yd. crawler-mounted draglines, and adding to this equipment yearly a few similar units of smaller capacity, a few crawler tractors with special attachments, a few trucks for its track, bridge and building, water service, scale, signal and work equipment departments, and subsequently, a total of two off-track weed mowers and a large-capacity tractor-mounted tie tamper compressor, this road is saving more than a quarter million dollars annually in work-train costs alone. In addition, with this equipment, it has carried out enlarged programs that could not have been completed with on-track equipment of many times the cost; has demonstrated the practicability of the equipment beyond question for a wide variety of operations, many of which were thought impracticable of accomplishment with such equipment in the past; has reduced some unit costs to as little as one-tenth former costs; and, withal—and of growing importance, has accomplished these results without interfering with traffic.

The story of what has and is being done with off-track equipment on this road indicates foresight, imagination and ingenuity all the way down the line. In the face of skepticism from within and without, this road has demonstrated economy, maximum production and minimum interference with the free movement and safety of train operation.

Large Savings in Work Trains

In 1937, the earth and rock-handling equipment of the D. & R.G.W. consisted of 11 steam ditchers and four 2½-yd. track-mounted steam shovels. The work-train expense in that year was $348,000. By 1940, the majority of these machines had been scrapped and replaced by a number of crawler dragline-shovels and crawler tractors equipped with bulldozer, trailbuilder and front-end loader attachments costing approximately $85,000. As a result of this change in equipment, work-train expense on the road in 1940, when more than twice as much work was done as in 1937, was only $53,000. And of this work train expense in 1940, only $1,124 was in connection with ditching and only $13,800 in connection with the distributing of new rail and picking up of old rail, whereas in 1937 the work train charges for these two operations were $140,172 and $45,000, respectively.

In 1941, with larger work programs and the purchase of additional units of off-track equipment, the savings in work-train expense over 1937 were still larger, and throughout these years there were further substantial savings in the cost of doing work through advantages inherent in the equipment itself, through the manner in which it is manned and operated, through minimum interference with train operation, and, in some cases, through the rapid restoration of blocked or damaged lines, reducing substantially the cost of train delays or detouring operations. And entirely aside from the savings effected, it is doubtful if the enlarged work programs of the last two years could have been completed with almost any amount of on-track work equipment, in view of the shortage that has prevailed in locomotives and cars for work trains, and the restrictions that

With Off-Track Equipment

would have been imposed by the increased revenue traffic that had to be handled.

As for its work in 1942, the D. & R.G.W., with the further additions which it is making to its off-track equipment, is in a more favorable position than ever before to carry forward its proposed work program economically, and without interference to the traffic that is expected.

Beginning its purchases of off-track equipment in 1937, the Rio Grande, with 2,255 miles of standard-gage lines, had by the close of 1941, the following such equipment in service: 10 draglines (some with shovel attachments) from ⅜ to 1¼-yd. capacity; 5 crawler tractors, from 35 to 85 hp., equipped with 2 front-end loaders, 2 overhead loaders and several bulldozer and trail-builder blades; 13 motor trucks of 1 to 3-ton capacity, with various body styles to meet requirements; 1—16-tool crawler-mounted tie tamper compressor; and 2 pneumatic-tired off-track weed mowers. To this equipment, the road is adding in 1942 2—⅜-cu. yd. crawler-mounted dragline shovels (already received); 1—85-hp. crawler tractor with trail-builder blade; 1—11-cu. yd. Carryall scraper (already received); 2 crawler-mounted air compressors of 250-cu. ft. capacity, each equipped with 18 tamping tools and hose; 1 pneumatic-tired weed mower; and 2—¾-ton panel-body trucks for use by the signal and water service departments.

As will be pointed out in the following, the variety of uses to which the D. & R.G.W. has put its off-track grading equipment covers practically the entire range of construction and

Above—A Front-End Loader Ditching Along the Main Line, Entirely in the Clear of Traffic. Right—Trucks and a Light Crawler-Mounted Shovel Cutting Back a Sliding Bank

Immediately Below —A Light Crawler Dragline, Cleaning Out a Choked Waterway Channel

maintenance operations, including fill and cut construction in connection with line and alinement changes, bank widening, ditching on and off the right of way, channel cleaning and channel changes, bridge filling, slide clearing, washout filling, snow removel and derailment clean-up work. In addition, certain of the equipment is used in a wide variety of general material handling, and the draglines are used to a large extent to distribute new rail and load out released rail in connection with rail-laying operations.

In May, 1941, six of the road's crawler dragline-shovels, with capacities varying from ⅜ to 1¼ cu. yd., carrying out grading operation of the various classes mentioned, handled 55,260 cu. yd. of dirt and rock at costs ranging from 3.6 cents to 5.2 cents per yard, and averaging 4.7 cents per yard, while a steam ditcher, working with a work train cleaning up several small loose rock slides, and hauling the material an average of ¾ mile, handled 1,680 cu. yd. at an average cost of 54 cents a yard. The costs given above for the dragline-shovel work represent out-of-pocket expense, including that for loading, unloading and moving the equipment from point to point, but do not include interest on the investment in the equipment or depreciation charges.

Bank Widening

The road's dragline-shovels, bulldozers, front-end loaders and trailbuilders have been used extensively in bank-widening operations. In 1937 and 1939, and again in 1940, in a general embankment strengthening program over the road, which was largely completed in 1940, a total of 126.67 miles of embankment was strengthened with this equipment, supplemented by only one work train, which was used for about four months in 1937. In this work as a whole, which involved the widening of both shoulders an average of 2½ ft., approximately 189,000 cu. yd. of material were handled at an average cost of 2.15 cents per cubic yard, exclusive of interest and depreciation on the equipment.

In practically all of this work, the required material was secured from side borrow, bulldozer and trailbuilder blades being used extensively on fills up to about eight feet high. On fills not exceeding three feet in height, the trailbuilder blade was angled and used to lift the material directly in place while the machine itself was operated parallel with the track. For heights between three and eight feet, bulldozers were operated at right angles to the track and pushed the dirt up, directly into place. Working in dessert territory along the line, widening banks three to six feet high an average of four feet on a side, large bulldozers completed from 9,000 to 11,500 lin. ft. of embankment strengthening a day, on one side, at a cost of less than 2 cents a yard.

In strengthening embankments in excess of eight feet high, crawler draglines, working alone along their tops or along their toes, as seemed advisable, have, in many instances, been able to reach out for their own strengthening material, and have placed it on the embankment faces for approximately 3.6 cents per cubic yard. Where telephone and telegraph lines have interfered with the operation of the draglines, bulldozers, working in conjunction with the draglines, have been used to push the borrow material laterally up against the toes of the fills, where it could be rehandled into final place by the draglines.

In the case of certain high fills, where the draglines could not reach the top of the embankment, it has been necessary to cast up the material to a convenient height, and then, working from this new level, to bring up the additional material required from a surplus piled along the base. Work of this character, generally requiring the use of a bulldozer in conjunction with the dragline, has cost approximately 6 cents a yard.

In a few cases, involving fills too high to be strengthened in this manner, trucks have been used to haul in the material, and, with hauls of less than 1,000 ft., have placed the material at a cost of approximately 11 cents a yard. Also, in at least one instance, a crawler shovel, loading into air-dump cars, completed a section of bank widening at a cost of approximately 15 cents a yard. It should be remembered that all of the cost figures given in the foregoing represent out-of-pocket costs only, and do not include interest on the investment in the equipment or depreciation.

Tractors and Carryalls Have Been Used to Large Advantage in Line-Change Grading Operations

Ditching and Cut Widening

Equally as extensive and interesting as the bank widening that has been done on the road with its off-track equipment, is the cut widening and ditching work done, which for the last few years has been carried out entirely with crawler draglines and tractor-powered bulldozers, front-end loaders and overhead loaders. Much of this work has been done by draglines working from the tops of side slopes, a method that has proved highly effective where banks are of suitable material and are not too high, piling the material along the top as a berm to prevent drainage water from running over the face.

For straight ditch cleaning and widening, tractor-mounted front-end loaders and MobiLoaders of the overhead type have been used extensively and economically, these units tracking back and forth in the cut, wasting the material at the ends, or, in the case of the MobiLoaders, loading into trucks for removal where conditions permit. Use of the front-end loaders, with 1-cu. yd. buckets, has usually been limited to cuts not longer than 1,000 ft., requiring a maximum haul of less than 500 ft., whereas with the larger 1½-yd. MobiLoader, the economical length of haul is extended considerably by its larger load-carrying capacity. Where trucks are used with the loaders, which can be done only where the ditch material is sufficiently dry to support them, the length of haul is not a limiting factor. Without the aid of trucks, work of this character has been done consistently at an average cost not exceeding 5 cents a yard. With trucks, the cost has been slightly lower.

Even straight bulldozing has been done effectively in cuts less than 500 ft. in length, using both bulldozer blades and trailbuilder blades and pushing the material directly out of the ends of the cuts. However, and in

spite of the fact that this can be done at a cost little greater than with the front-end loaders and MobiLoaders, it is not used generally, except in the shortest cuts. That any of these methods, however, are far more economical than the former method of using steam ditchers and dump cars, is seen in the fact that under the former method, work similar to the type in question has generally cost in excess of 50 cents a yard.

MobiLoader Effective

One of the most striking examples of the effectiveness of the 1½-yd. MobiLoaders employed on the road was the work done in 1941 in what is known as Cedarwood cut, near Walsenburg, Colo., a cut 4,600 ft. long, with side slopes averaging 35 ft. high and extending to a maximum height of 60 ft. at points. Here, the problem was entirely on one side, where continual sloughing off of the bank had not only completely filled the side ditch, but, at places, had begun to encroach upon the track.

The depth of the cut making dragline work from the top impossible, ditchers and work trains would have been the normal expedient for overcoming this condition and restoring the side ditch, but in this case a MobiLoader, working by itself with an operator and one helper, completed the entire job, and without fouling the operating track at any time.

Rigidly attached to one of the road's 45-hp. Caterpillar tractors, the MobiLoader, with its 1½-cu. yd. bucket, first dug its way into one end of the cut, and with each load, backed out and wasted the material on low-lying ground at the end of the cut. Disposing of its material overhead in an ideal position for loading motor trucks, trucks would have been used on this job, speeding up the disposal work, if it had not been for the wet character of the cut, the trucks operating down the track, as necessary, under flag protection, or in the newly excavated ditch.

Since the use of trucks here was impracticable, the tractor-mounted MobiLoader disposed of all of its own dirt. After it had cut its way from 900 to 1,000 ft. in from the end of the cut, it then, to shorten the haul of the excavated material, cut itself a ramp up the face of the cut on a grade of approximately 25 per cent, so that from that point forward it could waste all excavated material along the top of the cut, not only shortening its haul, but, at the same time, permit the building of a berm along the top of the cut for future protection against drainage over and washing out the face.

Using this outlet for the disposal of excavated material, the MobiLoader completed another 1,000 ft. of ditch excavation, and then built itself a second ramp up the face of the slope to again shorten the haul of the material excavated. In all, five of these outlet ramps were constructed in the 4,600-ft. cut while the machine worked progressively from one end to the other. Altogether, working 10 hours a day, approximately 15,400 cu. yd. of material was excavated, at a cost of 6.8 cents per cubic yard.

To have employed the road's former methods in this cut would have involved the use of a work train with dump cars and two or three ditchers, employing, aside from the train crew, an engineer and fireman for each ditcher and a number of pit men. In addition to the high costs which this would have involved for equipment charges, train crews and labor, a work train in this location would have had the added disadvantage that the nearest point that it could clear for revenue trains was about two miles away. This, under the traffic at the time, would have entailed a large loss of effective working time, and thus would have materially increased the unit cost of the work. In fact, whereas, with the MobiLoader, the work was completed in 110 days at an average cost of 6.8 cents per yard, it is doubtful if it could have been done with work train and steam ditchers in the same period at a cost less than 35 to 50 cents a yard.

Having so clearly demonstrated its effectiveness in this class of work, the MobiLoader has been used extensively in other cut-cleaning and cut-widening operations. With the 1½-cu. yd. loader, the length of haul has been limited to approximately 1,000 ft., permitting the loader to work from the opposite ends of cuts up to 2,000 ft. in length. The ¾-yd. front-end loaders have also been used in this class of work, but, with their relatively smaller capacity, limiting their economic length of haul to little more than 500 ft., they have generally been used in lighter work and in cuts not exceeding 1,000 ft. in length.

Bulldozers Have Been Used Extensively in Low Bank-Widening Operations

Daly Line Change

An interesting example of how certain other units of off-track grading equipment have been used effectively on the D. & R.G.W., and, incidentally, well into the winter months when the equipment cannot be used to the same advantage in certain classes of routine maintenance work, is the line change which the road completed about the first of the present year, known as the Daly line change, near Green River, Utah. Here, a 5-deg. 3-min. curve, placing speed restrictions on all trains, presented the only permanent slow order in a distance of 46 miles, and, obviously, was a source of delay and expense to train operation.

To overcome this unfavorable situation, the road undertook a line change on November 8, 1941, the new alinement being 3,352 ft. long and reducing the curvature to 2 deg. The new alinement involved a cut approximately 1500 ft. long, with side slopes up to 26 ft. high, flanked on both ends by fills ranging from 4 to 20 ft. high. Excavation consisted largely of shale beneath a two to three-foot cover of earth, and approximately one-third of the cut excavation was moved into the adjacent fill.

The equipment used on this job included one 85-hp. crawler tractor equipped with a trailbuilder blade and a 6-cu. yd. Carrymor wheeled scraper; one 75 hp. crawler tractor equipped with an 11-yd. Carryall wheeled scraper; and a sheep's foot roller — the Carrymor and Carryall scrapers and the sheep's foot roller having been rented from a contractor for this work.

With this small complement of equipment, and employing a force of only two operators and two helpers, the entire line change, involving the handling of 25,100 cu. yd. of material, was completed in less than two

months' time, at a cost of 7.3 cents per cubic yard. Largely as the result of the demonstrated effectiveness of the Carryall scraper on this and other jobs, the road has, as already mentioned, included an 11-yd. Carryall in its list of equipment to be purchased in 1942, and the unit has already been delivered. It is expected that this unit, which is equally as effective as a scraper in leveling-up operations as it is for hauling and disposing of waste material, will find widespread use in general right-of-way drainage and smoothing up work, as well as in subsequent line change and curve reduction work that may be undertaken on this road.

Bank Cutting

A somewhat different type of line change, employing the road's off-track grading equipment, was undertaken at Gilluly, Utah, during the last summer, the work here involving the shifting of two main tracks back into the face of a bluff a distance of approximately 20 ft. to get away from an unstable subgrade condition which was causing excessive track maintenance, even to the extent of requiring from one to two cars of cinders daily in resurfacing operations. Here, the main line rounds a bluff on a 9-deg. curve, the bluff, largely of shale, having a face varying from 60 to 85 ft. high. To get away from the sliding subgrade along the foot of the bluff, the road undertook a 2800-ft. line change, which called for cutting back into the bluff face a maximum distance of approximately 20 ft. and shifting the eastbound track inward to about the former location of the westbound track.

In undertaking this work, one of the road's 85-hp. crawler tractors with a trailbuilder attachment was used on top of the bluff to push off the overburden and as much rock as possible. Later, breaking down the upper face of the bluff, partly by shooting, was done by a rock gang.

The removal of all of this material brought down, as well as the cutting back of the lower face of the bluff, was done with one of the road's crawler-mounted dragline-shovels, equipped with a 1-cu. yd. shovel bucket, loading the material for disposal into three, and sometimes four, 3-yd. motor trucks, rented for the purpose. Working under flag protection, but without any interference with traffic, the shovel and trucks were operated along and on the main track, as necessary, during the early stages of the work, and subsequently entirely in the clear. In approximately two months' time, from June 12 to August 8, the work was completed, having involved the removal of approximately 24,000 cu. yd. of material, at a cost of 31.5 cents per cubic yard. Incidentally, it is of interest to note that the lowest contract bid secured on this job was 80 cents a cubic yard.

A Tractor-Bulldozer-Carrymor Scraper Outfit on One of the D. & R.G.W. Grading Jobs

Channel Work

Aside from the types of grading already referred to, the off-track grading equipment on the D. & R. G.W. has been used extensively and to large advantage in channel-clearing and channel-change work. Traversing for the most part mountainous country, and crossed by numerous streams, gullies and washes, one of the most severe problems of the road has been coping with the large volume of earth and loose rock that is brought down by flash floods in many of these waterways, debris that chokes the openings beneath the railroad and sometimes piles up on the tracks themselves unless removed periodically.

For this class of work, the road's crawler-mounted draglines have proved invaluable, working not alone within the limits of the right-of-way, but in many cases clearing channels several hundred feet back from the track. In other instances this equipment has been used in connection with the enlarging of bridge openings; for effecting complete channel changes to get away from side-hill wash and embankment erosion; and, not infrequently, for excavating diverting drainage ditches on, and sometimes far distant from the right of way, to intercept the flow of water which would otherwise strike vulnerable sections of embankment, and to direct it to pipe and bridge openings provided to carry it away.

Filling Bridge Openings

Still another class of work carried out effectively with the road's off-track grading equipment is that of filling bridge openings, where timber structures are being replaced with pipe, much of this work having been done to date, including two sizable jobs completed in 1941. One of these latter jobs involved the filling of a 28-panel frame trestle 448 ft. long, with a maximum height of 35 ft., located on an 8-deg. curve. The other job involved reducing the length of a 332-ft. frame trestle to 112 ft.

At Slides and Derailments

And entirely aside from these more routine grading operations, the off-track grading equipment on the D. & R. G. W. has been found invaluable in clearing away slides, filling in washouts and in cleaning up after train derailments. Experience has demonstrated that rock and dirt slides can be cleared up much more quickly and economically with the road's off-track equipment than is possible with on-track equipment. In the case of one slide approximately 500 ft. long and covering the track from four to nine feet in depth, a work train with a steam crane and clamshell had made little progress after working 10 hours, whereas, after one of the road's large bulldozers was moved in on the road to push the loose material laterally from the track, train service was restored in six hours.

In another and more serious instance, where a cloudburst in Glenwood canyon on the road had caused a total of 21 slides in a distance of about 14 miles, covering the track from a few inches to as much as seven feet, the road's off-track equipment again clearly demonstrated its superiority over on-track equipment. Here, where two steam ditchers, a locomotive crane, a 1¼-yd. crawler dragline, a 1-yd. crawler shovel and a large bulldozer were moved onto the work, the on-track equipment proved of limited value as it could work only from the end of the affected territory, whereas the crawler-mounted dragline, shovel and bulldozer cut into the work where most advantageous and

restored the line to service in less than 24 hours.

On this particular work, the bulldozer was found particularly effective in pushing the slide material over the river side of the embankment, it having been observed that for every ten feet of track cleared by the clamshell, the bulldozer opened up approximately 90 ft. Without the off-track equipment in this case of emergency, it is estimated that the line would have been tied up for four or five days, instead of the 24 hours that were required to restore it to service. And aside from the savings brought about in this work through the use of off-track equipment, resulting from the greater speed in handling material and materially lower operating costs of this equipment, far larger savings were effected through the reduction brought about in the cost of detouring trains, which involved movement for several hundred miles over another line.

The extent to which the road's off-track grading equipment is effective, and particularly its bulldozers, in clearing up after derailments, has been indicated in several instances, but no more strikingly than in the case of a derailment during the fall of 1941, at Cisco, Utah, where a flash flood took out a bridge beneath a freight train and piled up 26 cars, mostly in the wash. Here, along with two wrecking cranes and two pile drivers rushed to the job, the road's heavy bulldozer, equipped with a double-drum winch, was put into action. In addition to dozing dirt into the channel in connection with the restoration of the bridge, the bulldozer, employing the 40,000-lb. pull on its winch line, was used most effectively in pulling wrecked cars and equipment clear of the track, working wherever it could be used to the greatest advantage in speeding up the work, rather than being confined to the two ends, as was the case with the wrecking crews. After the tracks had been cleared of equipment, the bulldozer continued its effectiveness in clearing and piling wreckage and lading, and in pulling car trucks and wheels, and even car bodies, close to the track where they could be loaded out later by a locomotive crane and work train. To the effectiveness of the bulldozer on this particular work is credited not alone much of the speed with which the line was restored to service, but also a saving of about 80 work-train hours.

15 Trucks With Different Body Styles Serve the Maintenance Forces

Other Uses

Adding to all of these uses of the off-track grading equipment on the D. & R. G. W., this equipment has also been used for plowing riprap from cars and for distributing it, for cleaning up snow in yards and out on the line, and, in the case of the draglines, for unloading new rail and loading out released material. In fact, all rail unloading on the road is now done with light crawler-mounted draglines, stripped of their buckets and drag cables, and used as simple cranes.

As to snow-handling, the road has already used its bulldozers and front-end loaders for clearing snow from yard leads and about switch stands, and, while snow slides and heavy drifts on its lines are now relatively uncommon owing to improvements made in recent years to protect against them, the road's bulldozers are kept ready for this class of work in the event that they may be needed. In fact, largely because of the availability of its bulldozers for this class of work, the road retired its old rotary snowplow in 1940 and has not replaced it.

Moving Equipment About

To give its off-track grading equipment the greatest mobility between jobs, and, incidentally, to make each unit, together with its auxiliary equipment and operating crew, a self-contained outfit, each unit is provided with outfit cars that can be moved about the railroad at will in local freight trains or scheduled work trains employed in other operations. Thus, each crawler dragline has a car outfit including two flat cars for the unit itself, a tool car, a water car and a living car. Each tractor-equipped bulldozer, front-end loader or MobiLoader has an outfit including one flat car for the unit itself, a tool car, a water car and a living car.

For loading and unloading the crawler-mounted draglines, each dragline car outfit includes a portable ramp made up of 9-in. by 18-in. timbers, bolted together into a single unit, which is handled to unloading position and back onto the outfit car, as required, by the dragline itself. Loading and unloading the tractor equipment is accomplished by means of suitably-framed heavy timbers which are carried along with the equipment, and which can be readily handled by two men.

Where time is not an essential element, the tractor equipment is usually set off at the siding or other suitable track nearest to the work and operates under its own power, along the right of way, to the site of the work, this practice having been found feasible up to distances of five to six miles. At the close of each day's work, the equipment is left on the ground, suitably locked and protected against the weather, if it is not convenient to bring it in. The draglines, likewise, are generally unloaded at the siding most convenient to the work at hand, although, in many instances, they have been unloaded directly at the work site, the car outfit proceeding to the nearest available tying-up point.

Through these expedients, work-train service is practically eliminated in the handling of the equipment; moving of the equipment about after it has reached an assigned job is avoided; and the operator, and his helper where a helper is required, are afforded convenient living quarters, always close to their equipment.

Increasing Use of Trucks

Seeking in other of its maintenance work equipment some of the inherent advantages demonstrated in its off-track grading equipment, the Rio Grande, in recent years, as mentioned earlier in this article, has purchased a total of 15 motor trucks of various types and capacities, including two under order for delivery in 1942; three pneumatic-tired weed mowers, one for delivery during the present year; and a total of four crawler-mounted air compressors, each of 250-cu. ft. capacity, two of which are still to be delivered this year.

Through its purchases of motor trucks, trucks are now available to its scale inspection forces, work equip-

(Continued on page 197)

Union Pacific

Relaid 475 Miles

This article describes the organization and methods used by the Union Pacific last year in completing one of the largest rail relay programs in the country. The work was done principally by two mechanized gangs, each using two cranes and duplicate sets of adzing machines. The gangs worked from March until November. A third branch line rail laying gang was organized and worked on various lines during the latter part of the season

Left—One of the Three Power Spike Pulling Machines Used. Above—Two Sets of Three Adzing Machines Were Used, One Set For Each Rail

FACED with a large program of rail laying work in 1941, the Union Pacific began plans for this work during the preceding winter, and in March, as soon as the weather was favorable, two large fully-mechanized gangs were started on the more southerly lines of the system, one on the Los Angeles division and the other on the Kansas division. A feature of the rail laying work was the complete mechanization of the gangs, using two sets of adzing machines and two rail cranes with each gang. Special attention was given to the adzing and gaging operations to secure quality work. No delays to passenger trains and manifest freight trains were permitted, except those caused by a speed restriction which was placed on the new rail for a period of 48 hours.

The work was planned in a manner to prevent back travel and reduce to a minimum delays due to gang movements between jobs. The main line relay gang which started on the Los Angeles division worked northward toward Ogden, Utah and continued northward during the year, completing other relay work at various localities on the Idaho and Oregon divisions. The other main line relay gang completed its work on the Kansas division, moved north to the Nebraska division and then worked west, completing work on the Wyoming and Colorado divisions. A third gang was organized late in the season to relay rail on branch lines and at various scattered locations to avoid disrupting the program of the two gangs engaged in relaying rail on the main lines.

The amounts of rail laid during the year on the various divisions were as follows:

Division	Miles
Nebraska	79
Wyoming	171
Kansas	59
Colorado	31
Idaho	50
Oregon	25
Los Angeles	60
	475

All of this rail was new 131 lb. rail, which replaced 100 lb. rail, except 30½ miles of new 112 lb. rail, which

# of New Rail in 1941 with Mechanized Gangs and Without Delays to Traffic

Four Power Spike Drivers and a Compressor Were Used to Drive the Spikes

replaced 90 lb. rail. In addition to the relay of the new rail, numerous sidings were relaid with second-hand 100-lb. rail released by the rail relay work and 29 miles of second-hand relay on branch lines was completed. Extensive relays of branch lines with the released rail were not possible, however, since the government took a very large proportion of the released second-hand rail for the construction of trackage at industries and camps.

Controlled-Cooled Rail

The new rail laid in 1941 was all 39-ft. controlled cooled. Some of it, laid early in the spring of 1941, which had been ordered in the preceding year, had 24-in. 4-hole joint bars of the head contact type, but on all of the remainder, 36-in. 6-hole joint bars of the head-free, toeless type were applied. The tie plates used were double-shoulder 8-in. by 12-in., canted 1 in 40, with 8 spike holes, including 4 rail spike holes and 4 hold-down spike holes. Heat-treated 1-1/16-in. by 6-in. track bolts with various types of spring washers were used. The rail drilling was 1-5/16 in. in diameter, which provided a little extra allowance for rail contraction in the winter and is expected to help prevent broken bolts from that cause. The spikes used were $\frac{5}{8}$-in. by 6¼-in. with a reinforced throat.

Used Duplicate Equipment

Each day the gang laid one rail till noon and then dropped back and laid the other rail until closing time. In addition to the two cranes used, one for setting out the old rail, and the other for placing the new rail, two sets of three adzing machines were employed, one on each rail. At noon the first set of adzers was set off and left beside the track until the following morning and the other set of adzing machines was used in the afternoon.

The use of two sets of adzing machines had several advantages, one of which was that the adzing heads did not have to be readjusted for the afternoon operations. Great care was taken to be sure that adzers were set to adze a level seat for the new tie plates and for this purpose spirit levels had been installed on all the adzing heads. Because of the difference in height between the old 100-lb. and the new 131-lb. rail, the adzing heads that were adjusted to adze a level seat in the morning when the machines were traveling on the opposite 100-lb. rail, would have to be readjusted to adze a level seat in the afternoon, when the machines were traveling on the new 131-lb. rail. While the adjustment of the adzing heads is relatively simple and takes only a few minutes, these few minutes were saved and the possibility of overlooking the readjustment and giving the tie plate a canted seat on the tie was eliminated. The mechanic and tool grinders with the gang were given a better opportunity to service the adzers, make minor repairs, change adzing heads and bits and have them ready to go with a minimum of lost time the next shift.

Gang Organization

Each of the main line rail laying gangs had 155 men and was completely mechanized, using power spike pullers, power bolters, 2 rail cranes, 2 sets of 3 adzing machines, power spike drivers, a compressor, a power driven tool grinder, several motor cars and push cars, 2 gang motor cars and 7 trailer cars. The gangs worked an 8-hr. day 6 days a week. Each gang consisted of 1 extra gang foreman, 4 assistant foremen, 1 welder, 1 road machinist, 3 equipment operators, 24 machine men, 107 laborers, 4 water boys, 4 tool men, 3 motor car operators and 3 flagmen.

In detail the organization and operations of one of these gangs were as follows: One assistant foreman and 12 men with a motor car and push car distributed the material, previously unloaded by the work train which unloaded the rail. This crew placed tie plates, spikes, plugs, bolts, etc., and hung the two angle bars on the leaving end of the new rails, using one bolt in the rear hole. It also cleaned out road crossings ahead of the rail laying work and performed any other advance work.

Two Burro Cranes Were Employed, One to Set the Old Rail Out, and One to Set the New Rail In Place

The dismantling and removal of the old rail were under the jurisdiction of another assistant foreman. This part of the gang included 2 men with sledges, knocking off rail anchors; 9 men operating 3 power spike pullers; 2 men with 2 power bolters, removing the nuts from the joint bolts; 2 men with claw bars, pulling joint spikes and any spikes missed by the spike pulling machines; 4 men removing the joint bars and cutting the bond wires; an operator and 1 laborer, with a rail crane, which operated backwards, setting out the old rail; and 6 men throwing out old tie plates.

The third assistant foreman was in charge principally of the adzing operations. Under his jurisdiction 10 men set and drove down tie plugs and also drove down any spike stubs, 16 men with shovels and picks lowered the ballast in the cribs between the ties, 4 men with switch brooms swept the ties clean for the adzing, 3 men with 3 power adzers adzed the ties individually, each man completing the adzing on every third tie, 2 men with brooms swept the ties behind the adzers, 3 men with a bucket of creosote and brushes applied creosote to the adzed surfaces of the ties and 8 men placed new tie plates.

The fourth assistant foreman was in charge of the remainder of the gang, consisting of the rail crane and the gagers and spikers. The operations of the remainder of the gang were as follows: An operator and 4 track men with the crane set the new rail in place and placed expansion shims. Along with this crane was 1 welder with an oxy-acetylene cutting torch who assisted in closing up for trains and who also cut bolts that were not loosened by the head bolting machines. Such rails were set out by the first crane without being disconnected. Following the rail crane, 4 men adjusted the new joint bars, applied bolts and nut locks and started the nuts, 4 men with 2 bolting machines tightened the bolts and 4 gaging crews, consisting of 3 men in each crew, followed, gaging every fourth tie. Twelve men with short-handle hammers set spikes and straightened tie plates. One operator and 8 men with a compressor and 4 power spike driving hammers followed, driving spikes. The 8 men were needed to change off on the power spike drivers. The 4 extra men, when not engaged in spike driving, worked behind the compressor, applying rail anchors. Behind the spike drivers, 4 men with 2 push cars picked up any unused new material, 2 motor car operators operated 2 gang motor cars with 7 trailers to take the gang to and from work.

Spiking and Gaging

In addition to the above men, 1 mechanic worked with the gang and serviced all mechanical equipment, 4 men with a power driven tool grinder mounted on a push car sharpened bits for the adzing machines, 4 water boys were distributed through the gang and 3 flagmen were used, including a motor car operator. The gang also had 1 timekeeper, 1 material man to charge out material as it was used and 1 "blue book" man, who made a record of each new rail, noting the heat number, letter, ingot number, length and its location.

In the relay work, on both tangent and curved track the rail was full-spiked by the rail gang, with two rail spikes per tie plate. Later the follow-up gangs drove two hold-down spikes per tie plate on tangent track, making a total of eight spikes per tie. On curves of three degrees or sharper, the follow-up gangs double spiked the cuves on the inside and also drove additional hold-down spikes, making a total of 10 spikes per tie.

In addition to the care exercised in adzing, great care was taken to secure good gage. To insure this, the gages were checked every morning and again at noon, to be sure that they were all 4 ft. 8-11/16 in. in gage. The rail was gaged 3/16 in. wide because it had been demonstrated that after several days' settlement under traffic, the gage usually closed up about that much, i.e. each rail canted or settled inward about 3/32 in. under traffic.

Flagging Operations

As mentioned previously, the rail gang was not allowed to flag any passenger trains or manifest freights. However, drag freights and local freight trains were stopped, if necessary, for the gang did not start to close up for such trains until they were in sight. An operator with a portable telephone traveled with the gang and was in constant communication with the dispatcher, thus providing the foreman with up-to-the-minute information on train movements so that the gang could work as long as possible and not lose any more time than necessary.

Two of the three flagmen operated in the usual manner and were stationed each way from the gang. The third flagman operated on a small motor car and went out on his car to call in a flagman whenever the track was safe for regular operation, thus allowing the gang to work up to the last minute and at the same time not cause any train delays.

When closing up for a train, all light equipment was set off the track while the cranes ran to the nearest sidetrack to get in the clear and the entire gang worked to make the track safe for the passage of trains. The welder cut the old rail with an oxy-acetylene torch. Off-set angle bars and a set of ten steel riser or shim plates were used, which were carried on the second crane. The riser plates provided a run-off from the new 131-lb. rail to the old rail

about one-half a rail length long. During the day, when a temporary closure was made for only one or two trains, two bolts were applied on the 131-lb. end of the off-set joints and the trains were allowed to pass over. However, when closing up at noon and at night, the old rail was drilled and the off-set joints were full-bolted. A slow order of 20 m.p.h. for freight trains and 30 m.p.h. for passenger trains was placed on the new rail for a period of 48 hours to allow it to get properly settled without being kinked or knocked out or line and gage.

Follow Up Operations

Immediately behind the rail laying work, a gang of 35 to 40 men tamped up all loose ties and drove all the hold-down spikes on the line rail. This gang also corrected any work of the rail gang that warranted attention, such as bent spikes or spikes not driven, etc., with the exception that no gage adjustments were made. As this gang completed its work, the slow order on the new rail was lifted progressively. Several days to a week later, a second gang of 60 men followed, lining the track, spacing joint ties, making all gage adjustments, tamping up any ties that were still loose and driving the hold-down spikes on the gage rail.

Although this road has always considered it desirable to surface track out-of-face behind new rail, this was not done on the Union Pacific in 1941, because the size of the rail laying program would have required a further enormous expenditure if all of the track relaid had been surfaced out-of-face, and the money assigned during the year for this type of work was used principally for the rail laying operations. Special care was taken, however, as previously explained, to see that all loose ties were tamped after the rail laying work and that irregularities in line and gage were corrected.

When delays due to traffic were not frequent, these gangs relaid from 2½ to 3 miles daily. On heavy traffic single track main lines, with numerous train movements during the working period, the rate of progress of these gangs was reduced to about 1 to 1.3 miles daily, and late in the fall, during the peak of the 1941 traffic, it became difficult at times for some of the gangs to average 1 mile per day.

This work was planned and carried out under the supervision of B. H. Prater, chief engineer of the Union Pacific, Omaha, Neb. The district engineers, L. W. Althof at Omaha, W. C. Perkins at Salt Lake City, Utah, and N. C. Pearson at Portland, Ore., together with the division engineers and general roadmasters were responsible for the rail laying work on their territories.

D. & R. G. W. Use of Off-Track Equipment

(Continued from page 193)

ment field repairmen, most of its bridge, building and water service men, and to some of its track forces. These trucks are used to haul men and materials over distances up to approximately 50 miles, and for this have proved highly flexible and economical, often precluding long delays that would be occasioned in the use of any form of rail transportation. In addition, the trucks can generally be kept busy while the men are at work, and make it possible for the men to return to their homes at night. This latter factor is of advantage to the men in that they can be with their families at night, and to the company in that it is relieved of maintaining the many camp-car outfits that would be necessary otherwise. In addition, the trucks have been found highly valuable in many instances in rushing men, tools and materials to points of emergency work.

Crawler Compressors

The Rio Grande's experience with crawler-mounted tie tamper compressors is still relatively limited, it having purchased its first two such units in 1941. However, the greater overall efficiency of these units as compared with on-track compressors was demonstrated so conclusively in that one working season that, as already mentioned, the road decided to purchase the two additional units of such equipment for use in its 1942 work.

Tests made last year with the two 250-cu. ft. crawler-mounted compressors then on the road showed that these units, each operating 16 tamping tools through not more than 100 ft. of flexible hose, could surface an average of 4800 lin. ft. of heavy slag-ballasted track a day, with a maximum raise of 2 in., whereas, with three on-track compressors in the same territory, working under the same general conditions, operating 32 tamping tools through 2,000 ft. of metal air line with outlets at intervals, it was possible to surface an average of only 3,300 lin. ft. of track a day.

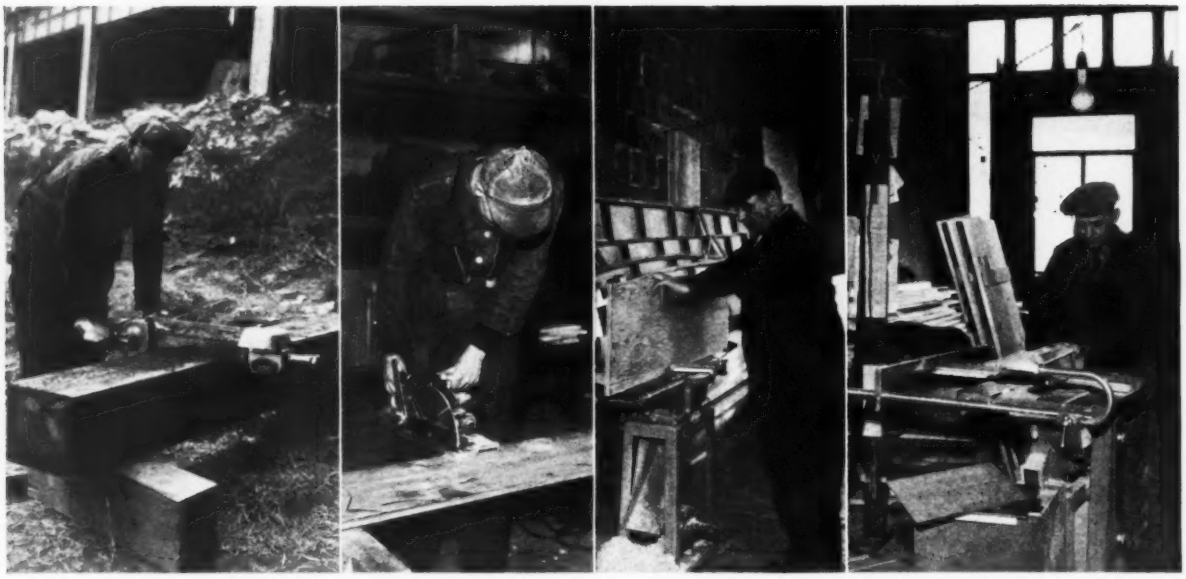
While several factors, no doubt, entered into the greater output of the crawler-mounted compressor outfits, one of the largest factors was evidenced in a study made, which showed that whereas in the case of the on-track compressors, as much as 10 per cent of the labor of the entire gang was employed in moving the compressor and its air lines, only about 4 per cent of the time of the entire gang with the crawler-mounted compressor was employed in handling the compressor and its short air lines.

Off-Track Mowers

As in the case of its other units of off-track equipment, the D. & R. G. W. has found many advantages in its pneumatic-tired, tractor-type weed mowers, especially in territories where the character of the right of way permits their most effective use. Operated entirely clear of the track, and, therefore, without flag protection, these mowers have been used effectively for general right-of-way mowing, for shoulder mowing, for keeping down vegetation at grade crossings, and for trimming up at station grounds, releasing for other work many men employed formerly with scythes and other hand tools. The machines used will cut brush up to ½ in. in diameter, and, through the rapidity with which they work, the road has been able to make repeated mowings during the growing season, keeping down noxious weeds much more satisfactorily than was possible heretofore with hand scythes and other types of mowers. At the same time, sizable economies have been effected in carrying out the work.

All of the maintenance of way work equipment on the D. & R. G. W. is operated by men especially qualified and trained for their work, and the equipment itself is kept in a high state of operating efficiency by well-organized and equipped equipment maintenance force. Valuable as the road's off-track equipment has proved in the past, it is expected that with an enlarged work program in 1942, a threatened shortage of labor, increased traffic, and work trains largely out of the question both from the standpoint of their cost and their interference with revenue traffic, this equipment will prove still more valuable in the months ahead.

All of the new and revised work methods referred to in this article were planned and initiated under the direction of A. E. Perlman, chief engineer of the Denver & Rio Grande Western. The equipment itself is operated under the immediate direction of the division engineers on whose territories it is working at any particular time, while its maintenance and repair are under the direction of A. J. Neff, supervisor of work equipment.



From Left to Right—A Motor-Operated Chain Saw of the One-Man Type; One of the Many Hand-Held Circular Saws on the Pennsylvania; This 6-In. Jointer Paid for Itself on One Job; A Tilting Table Circular Saw, Which Also Paid for Itself on One Job

B. & B. Forces Get Power Tools on the Pennsylvania

This road is now carrying out a program to equip its bridge and building forces with small power tools, and the necessary portable power plants for operating them, the objective being to make such tools available wherever the work is such that they can be used with economy. The essential details of the program are given in this article

FOR several years the Pennsylvania has had under way a program for furnishing its bridge and building forces with small portable power tools with the ultimate objective of making such equipment available in all cases where it can be employed with economy, supplementing the preframing of timbers by machine at treating plants. As a result, the use of hand methods in carrying out repair and maintenance tasks on bridges and buildings is passing out of the picture on this road as rapidly as the power equipment can be obtained, and the railroad is looking forward to the time when its forces will be fully equipped with power tools. Reference is not made here to the larger items of mechanical equipment that are in common use by bridge and building forces, but rather to the smaller units that have come into use in recent years for performing such operations as boring, drilling, cutting, dapping and chipping.

How Their Use Started

In general it may be said that small power tools were first brought into use on the Pennsylvania at points where there were local sources of power such as air lines in yards and commercial electrical power lines. As the economy of such tools was demonstrated by experience with them at these locations, their use was extended to outlying sections through the provision of portable power plants. There was also another avenue through which portable power tools were introduced on this road. Some years ago a number of portable outfits, consisting of gasoline engine-driven electric generators, with power saws and drills, were obtained to carry out certain emergency repairs, and these were later assigned to the bridge and building forces for use in carrying out their routine activities.

The railroad was so impressed with the results obtained with the power tools thus acquired that it was decided to purchase them in such numbers that they would be available wherever there was work to be done on which they could be used profitably. To date, considerable progress has been made, but nevertheless the railroad feels that its bridge and building forces are still far from 100 per cent mechanized. For instance, it is estimated that the Eastern region has gone only about three-fourths of the way.

Various Types of Power

While emphasis is being placed on the acquisition of electrically-driven tools and the generators for operating them, the policy is to provide tools of the type that is best suited to the character of the work on which they are to be employed. Thus, in addition to the electric units, the railroad also uses pneumatic tools and those of the gasoline engine-operated mechanically-driven type, these latter

being tools that are operated through flexible shafts. The more common types of tools that are being acquired under the program include electric and pneumatic driven saws of both the chain and circular types, boring tools for working in wood, steel and stone, hammers of various types, wrenches and timber dappers.

In providing power equipment for its bridge and building forces, the Pennsylvania does not in general follow the policy of furnishing each gang with a complete complement of tools; rather the practice is to "pool" the equipment on each division so that it can be assigned in the proper quantities and types to individual gangs to meet the needs of the particular jobs on which they may be engaged at a given time. However, insofar as electric tools are concerned, what is known as a "Letter of General Practice" has been issued, in which are listed the numbers and types of tools that it was expected would be furnished to different types of gangs of varying sizes. It was contemplated that this letter would serve as a guide for the local forces in requisitioning equipment to meet their particular needs.

The Letter of General Practice gives separately the size and number of power plants and the types and numbers of power tools to be furnished, in accordance with the number of men per gang, to carpenter crews, iron workers, mason gangs, and paint gangs. According to the letter, the generators to be furnished are of either the 3,000-watt or 5,000-watt sizes. The number and size of the generators to be provided depend on the power requirements of the tools that are furnished to the particular gang, allowing sufficient surplus capacity for operating flood lights during emergency repair operations at night, if necessary. Under carpenter gangs, the power tools listed are for crews of 4, 6, 8, 12, 16 and 20 men and, for each gang, they include a chain saw, one or two circular saws of the size making a six-inch cut, one or two 1⅛-in. reversible drills, a hammer and a timber dapper.

Other Gangs

For iron workers, the power-tool requirements are given for gangs of 4, 6, 8, 12 and 16 men and include a 1⅛-in. reversible drill, and one, two or four hammers, depending on the number of men in the gang. For masons, the requirements for gangs ranging from 4 to 20 men are given as one or two 1⅛-in. reversible drills and one or two 1½-in. drill hammers, while for painter gangs having 4 to 12 men, three or four hammers and one or two portable grinders are recommended. It should be understood, of course, that the foregoing covers only electrically-driven tools and does not include other types of power equipment that may be supplied to individual gangs, such as pneumatic tools or gasoline-driven spray painting outfits for paint gangs.

Because of the manner in which the accounting is handled for the purchase of these small power-operated units, most of which are classed as tools instead of machines, it is not possible to give the total number that have been acquired to date. However, as one indication of the progress that is being made, six ¾-in. electric drills and 12 air-operated boring machines were acquired on one region in December, 1941, alone. One the average, it is estimated that some of the larger divisions have at the present time about five drills, the same number of boring tools, several chain saws and four or five hand-held circular saws, together with the necessary compressors or generators for operating them. However, it should be borne in mind that the mechanization program is still far from complete and that by the time full mechanization is achieved, the number of tools given here will have been enlarged considerably.

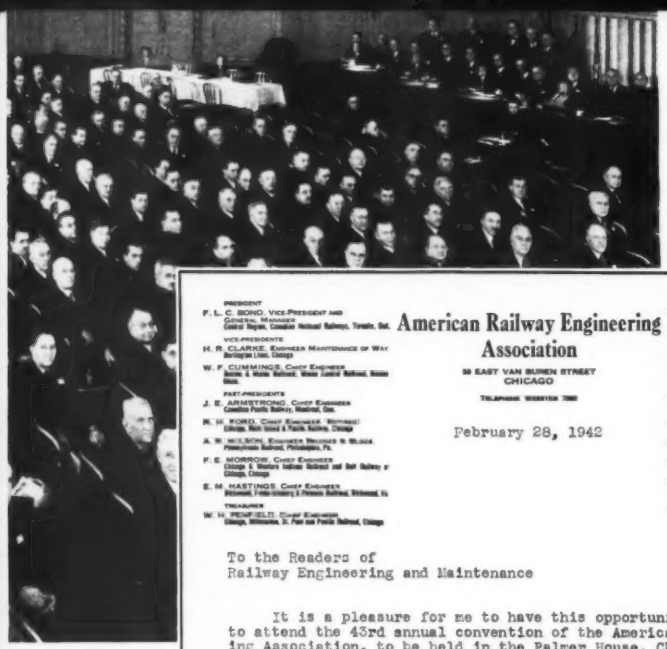
It should be mentioned also that, along with its program to provide the bridge and building forces with small power tools, the Pennsylvania has not neglected other phases of the mechanization of these forces. For instance, considerable numbers of motor trucks for hauling men and materials have been acquired and are rendering valuable service. Also, effective and extensive use is being made of light tractors, some of which have been equipped with compressors for furnishing air for the operation of pneumatic tools. Spray-painting equipment has come into wide use on this road, including highly portable wheelbarrow mounted units that are being employed in painting catenary poles in electrified territory and which can be used in other types of work.

Special Equipment

Recognizing, as it does, the value of mechanization in bridge and building work, the Pennsylvania is awake to the opportunities for effecting savings that may be provided by the use of special types of equipment, not otherwise commonly used, either in shops or on individual jobs where there may be a large amount of work of a particular type to be done. This is true particularly of wood-working machines. For instance, when it recently became necessary to carry out extensive alteration work in a large passenger station, that required the installation of a large amount of shelving, a 10-in. motor-operated, tilting-table circular saw and a 6-in. motor-operated jointer were obtained, each of which paid for itself in about a week's time.

In fact, it has been the experience on this road that not infrequently the savings effected by power tools on a single job are sufficient to pay the cost of the equipment. The example may be cited of a recent bride burnout involving a timber trestle about 700 ft. long. In reconstructing this bridge, two portable generators were employed, each of which was used to operate a ⅝-in. auger in boring bolt holes in 7-in. by 9-in. ties. Using this equipment, a total of 4,000 holes were bored in four hours. On jobs such as this one, the saving in cost is, of course, incidental, the principal objective being to restore the structure to service as quickly as possible, and the part that they play in contributing toward this end constitutes an important advantage of power tools.

Portable Generators, Operating Power Tools and Floodlights, Have Proved of Great Value in Emergency Work



A.R.E.A. to Hold Meeting

President invites readers to attend annual three-day session in Chicago, March 17-19. Sees added importance to get-together this year to face largely increased problems

PRESIDENT
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M. H. FORD, Chief Engineer, Northern Pacific Railway, Minneapolis
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F. E. MORROW, Chief Engineer, Chicago & Western Indiana Railroad and Belt Railway of Chicago, Chicago
E. M. HASTINGS, Chief Engineer, Richmond, Fredericksburg & Potomac Railroad, Richmond, Va.

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A. A. MILLER, Chief Engineer Maintenance of Way, Missouri Pacific Railroad, St. Louis, Mo.
G. P. PALMER, Engineer Maintenance and Construction, Baltimore & Ohio Chicago Terminal Railroad, Chicago
ARMSTRONG (VACANT), Chief Engineer, Alton Railroad, Chicago
F. S. SCHWINN, Assistant Chief Engineer, Missouri Pacific Lines, Houston, Texas
E. T. HOWSON, Vice-President and Western Editor, Railway Age, Chicago
S. M. KULP, Chief Engineer, Chicago & North Western Railway, Chicago

SECRETARY
W. B. LACHER, 59 East Van Buren Street, Chicago

February 28, 1942

To the Readers of
Railway Engineering and Maintenance

It is a pleasure for me to have this opportunity to invite you to attend the 43rd annual convention of the American Railway Engineering Association, to be held in the Palmer House, Chicago, March 17-19. Since the last annual meeting of our Association, world events have piled huge added national responsibilities upon our railways - responsibilities that are confronting railway engineering and maintenance officers with many new and difficult problems.

The primary object of the A.R.E.A. is the advancement of knowledge pertaining to the scientific location, construction, operation and maintenance of the railways—and in this respect, to be of the greatest assistance to railway engineering and maintenance men. We have kept faith with this objective in the past, and we shall not fail now when the need of these men is greater than ever before. In our forthcoming convention, culminating another year of intensive work, the association offers you an outstanding opportunity to appraise the problems that lie ahead and to come abreast of the latest developments in railway engineering and maintenance practices.

At the convention, 25 committees will report on 115 subjects, dealing with current problems in railway engineering and maintenance work. These reports will be supplemented by addresses by speakers of national and international interest and reputation, including Joseph B. Eastman, chairman of the Office of Defense Transportation, who will speak on What Will Be Expected of the Railroads, at the session on Tuesday afternoon.

More than ever before, the convention this year should be of interest and benefit to you and the railways you represent. I hope, therefore, that you will consider this a personal invitation to attend the convention, and will be present especially at those session at which the subjects most clearly related to your work will be considered.

Yours sincerely,

F. L. C. Bond, President

F. L. C. Bond, President

Program to Include Presentation of Reports on 115 Subjects and an Address by Jos. B. Eastman

IN an atmosphere more tense with new responsibilities and problems than for many years in the past, engineering and maintenance of way and structures officers of the railways of the United States and Canada will meet in Chicago, March 17-19, under the auspices of the American Railway Engineering Association, to appraise the problems that lie ahead and study ways and means of meeting these problems in the over-all interest of maintaining railway transportation adequate to every need of our huge war efforts. This will be the forty-third annual meeting of the association, and, as for a number of years in the past, it will be held in the Grand Ballroom of the Palmer House. Supplementing the meeting activities proper will be the annual exhibition of equipment and materials of the National Railway Appliances Association which, as announced on following pages, will this year be held in the Exhibition hall of the meeting hotel, adjacent to the meeting room.

Particularly in view of national and international developments since the Association's meeting a year ago, calling for increased transportation, higher speeds, expanded facilities and a high standard of track and structures maintenance—all in the face of threatened shortages in materials, labor and equipment, it is expected that the annual meeting this year will take on increased significance. Special features of the program will include an address by Joseph B. Eastman, director of the Office of Defense Transportation, on What Will Be Expected

Intensive at Chicago

of the Railroads, at the session on Tuesday afternoon; and the annual luncheon on Wednesday, which will be addressed by Hon. H. J. Cody, president of the University of Toronto, Toronto, Ont.

Another feature of special interest will be the Eighth Progress report of the Joint Investigation of Fissures in Railroad Rails, by H. F. Moore, research professor of engineering materials, University of Illinois.

Forming the main body of the meeting program, 25 special and standing committees of the Association will present reports on 115 subjects covering a wide range of routine and special problems confronting track, bridge, building and water service officers—problems that have not only taken on added importance during the last year, but which promise to assume even greater importance in the days ahead. Representative of the committee reports to be presented are those on causes and control of splitting in railroad ties; specifications for creosote-coal tar solutions; various types of cribbing and retaining walls; plans and specifications for track tools, with recommended minimum limits for reclaimed tools; plans for switches, frogs, crossings, and spring and slip switches; bolt tension necessary in rail joints; specifications for the design of wood bridges and trestles; specifications for steel railway turntables; specifications for welded buildings; modernization of passenger terminals; lubrication of roadway machines; labor economies through various methods of doing work; and practicable sizes of water columns and supply lines.

The regular sessions of the meeting will be presided over by F. L. C. Bond, president of the association, and vice-president and general manager of the Central region of the Canadian National, assisted by Vice-President H. R. Clarke, chief engineer maintenance of way of the Chicago, Burlington & Quincy. In the letter from President Bond, reproduced herewith, a special invitation is extended to the readers of *Railway Engineering and Maintenance* to attend the meeting.

Program

43rd Annual Meeting

Palmer House, Chicago

Tuesday, March 17

Morning Session—9:45 A.M.

Convention called to order
Address by F. L. C. Bond, president
Reports of the Secretary and the Treasurer
Reports of committees on
- Standardization
- Signals and Interlocking
- Electricity
- Waterways and Harbors
- Economics of Railway Location and Operation

Afternoon Session—2 P.M.

Address by Joseph B. Eastman, director, Office of Defense Transportation, on What Is Expected of the Railways
Reports of committees on
- Highways
- Co-operative Relations with Universities
- Water Service, Fire Protection and Sanitation

Adjournment at 4:30 p.m. to visit the exhibition of the National Railway Appliances Association in the Exhibition Hall of the Palmer House

Wednesday, March 18

Morning Session—9 A.M.

Reports of committees on
- Economics of Railway Labor
- Maintenance of Way Work Equipment
- Wood Preservation
- Roadway

Association Luncheon, 12 o'clock

Address by Dr. H. J. Cody, M.A., D.D., LL.D., President, University of Toronto

Afternoon Session—2:30 P.M.

Reports of committees on
- Ties
- Track
- Rail

Eighth Progress Report on the Joint Investigation of Fissures in Rails, by Prof. H. F. Moore

Thursday, March 19

Morning Session—9:00 A.M.

Reports of committees on
- Uniform General Contract Forms
- Buildings
- Yards and Terminals
- Records and Accounts
- Iron and Steel Structures
- Wood Bridges and Trestles

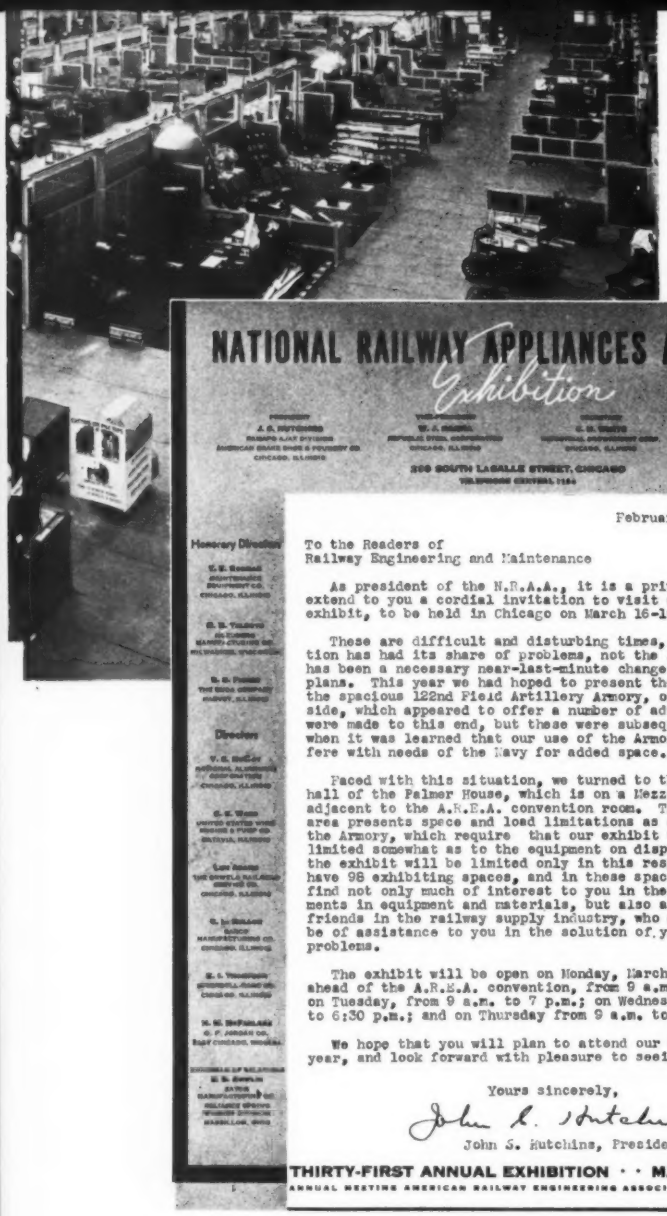
Afternoon Session—2 P.M.

Reports of committees on
- Clearances
- Waterproofing of Railway Structures
- Impact
- Masonry

Closing Business

Annual Exhibit at Palmer

National Railway Appliances Association to hold exhibit in new quarters. Seeks to be of greatest help to railway engineering and maintenance officers in solving their material and equipment problems



NATIONAL RAILWAY APPLIANCES ASSOCIATION

Exhibition

320 SOUTH LASALLE STREET, CHICAGO

February 28, 1942

To the Readers of
Railway Engineering and Maintenance

As president of the N.R.A.A., it is a privilege for me to extend to you a cordial invitation to visit our 31st annual exhibit, to be held in Chicago on March 16-19.

These are difficult and disturbing times, and our association has had its share of problems, not the least of which has been a necessary near-last-minute change in our exhibit plans. This year we had hoped to present the exhibit in the spacious 122nd Field Artillery Armory, on the near north side, which appeared to offer a number of advantages. Plans were made to this end, but these were subsequently abandoned when it was learned that our use of the Armory might interfere with needs of the Navy for added space.

Faced with this situation, we turned to the Exhibition hall of the Palmer House, which is on a Mezzanine floor adjacent to the A.R.E.A. convention room. This exhibition area presents space and load limitations as compared with the Armory, which require that our exhibit this year be limited somewhat as to the equipment on display. However, the exhibit will be limited only in this respect. We will have 98 exhibiting spaces, and in these spaces you will find not only much of interest to you in the latest developments in equipment and materials, but also a host of your friends in the railway supply industry, who are anxious to be of assistance to you in the solution of your increasing problems.

The exhibit will be open on Monday, March 16, one day ahead of the A.R.E.A. convention, from 9 a.m. to 6:30 p.m.; on Tuesday, from 9 a.m. to 7 p.m.; on Wednesday, from 9 a.m. to 6:30 p.m.; and on Thursday from 9 a.m. to 3 p.m.

We hope that you will plan to attend our exhibit this year, and look forward with pleasure to seeing you.

Yours sincerely,

John S. Hutchins

John S. Hutchins, President

THIRTY-FIRST ANNUAL EXHIBITION · · MARCH 16 TO 19, 19

John S. Hutchins, President

WITH the purpose of extending every possible aid to railway engineering and maintenance officers in meeting their increasing problems through modern materials and equipment, and through the most effective use of their already available materials and equipment, members of the National Railway Appliances Association are attaching more than ordinary importance to the 31st annual exhibit of their association, to be held in Chicago on March 16-19, inclusive, coincident with the meeting of the American Railway Engineering Association. Already 68 companies have arranged to take part in the exhibit and, as pointed out in the above letter from John S. Hutchins, president of the N.R.A.A., inviting the readers of *Railway Engineering and Maintenance* to visit the exhibit, a large number of representatives of these manufacturers will be on hand to assist them in every way possible in the solution of their problems relating to materials and equipment.

Due to circumstances pointed out by Mr. Hutchins in his letter, the exhibit this year, instead of being held in the International Amphitheatre as for a number of years in the past, will be held in the Exhibition hall of the Palmer House, on a mezzanine floor almost immediately alongside the meeting area. The exhibit will be open to visitors during four days, beginning on Monday, March 16, one day ahead of the A.R.E.A. meeting, and a part of the program will include a buffet supper for members of the N.R.A.A. and their railway friends on Tuesday evening, in the Grand Ball Room of the hotel. The hours during which the exhibit will be open on each of the days are as follows:

Monday, March 16—9 a.m. to 6:30 p.m.
Tuesday, March 17—9 a.m. to 7:00 p.m.
Wednesday, March 18—9 a.m. to 6:30 p.m.
Thursday, March 19—9 a.m. to 3:00 p.m.

The exhibit this year is being directed by John S. Hutchins, (Ramapo Ajax Division, American Brake Shoe & Foundry Company) president of the association, and C. H. White (Industrial Brownhoist Corporation), secretary. A list of the companies that will participate in

# of Equipment and Materials House, Chicago, March 16-19

the exhibit, with their booth numbers, is presented herewith, together with a floor plan of the Exhibition hall, showing the exhibit spaces and their respective numbers.

Exhibiting Members

American Car & Foundry Company, New York....14-15
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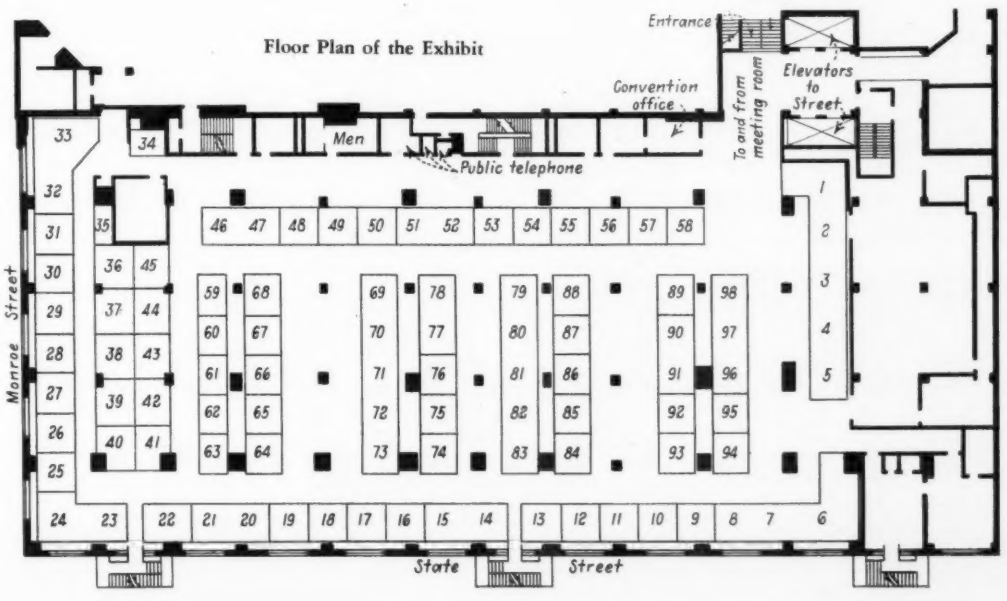
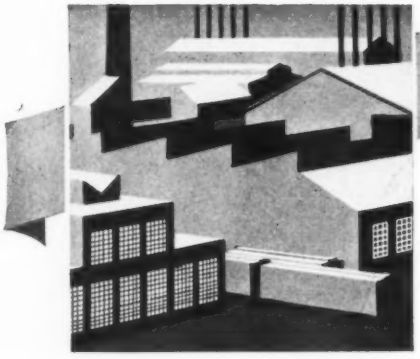




PRODUCTS of Manufacturers

Woolery Joint Oiler

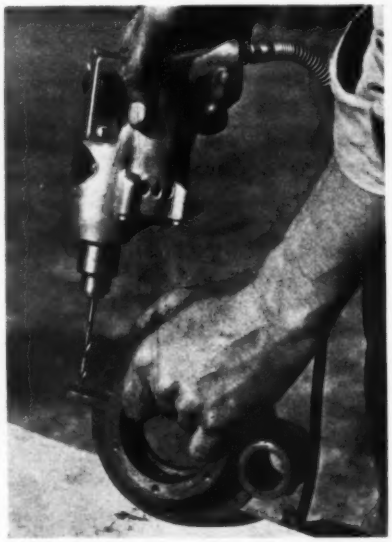
THE Woolery Machine Company, Minneapolis, Minn., has produced a new joint oiler machine that is designed for the convenient and thorough oiling of rail joints, switch stands and interlocking apparatus. The machine consists of an 18-gal. cylindrical tank mounted on its side on a frame with two double flanged wheels and an outrigger and roller extending to the opposite rail. A 10-ft. length of hose is connected to the center of the tank at one end and a spray gun is attached to the other end of the hose. The hose is sufficiently strong to permit the tank to be pulled along the track by the hose.

The Woolery Joint Oiler Is Designed for Oiling Rail Joints, Switches and Interlocking Apparatus

In operation, the tank is filled two-thirds full of the oil and then the required air pressure is pumped in. The spray nozzle has a compound action; the trigger is squeezed to the first stop for a rather gentle spray on the outside of the joints and to the second stop for a more forceful spray between the joint bars and the rail. The spray gun is handy, being long enough for the operator to apply the oil without bending over. A strainer is provided in the tank filler opening to prevent the entrance of foreign matter.

Model 143 Mall Drill

THE Mall Tool Company, Chicago, has placed a new ¼-in. electric drill, Model 143, on the market, which is light in weight and can be operated easily with one hand. The drill has a universal-type electric motor for either 110 or 220 volt a.c. or d.c. current, with alloy steel gears which drive a three-jaw chuck. It is enclosed in a streamlined die-cast aluminum housing with a pistol grip. The drill has a no-load speed of 2200 r.p.m., a full-load speed of 1800 r.p.m., an over-all length of 7¾ in. and an over-all height of 4⅜ in. Without the electric cord, it weighs only 3 lbs. It is designed for long service life, with extra long motor brushes, self-lubricating bearings and special alloy-steel gears. Special easily accessible openings are provided in the metal housing for cleaning the commutator and for brush inspection when necessary.



The Model 143 Mall Drill Weighs Only 3 lbs. Without the Electric Cord

Because it is very light and compact in design, the Model 143 is said to be specially adapted for drilling in close quarters and for production and maintenance work. It is said to have ample power, that it cannot be stalled in hand drilling, and that it will run cool under severe service.

Nordberg Power Jack

A NEW Nordberg power jack that weighs less than half the weight of the previous model, but which has greater lifting capacity and is faster in operation, has been developed by the Nordberg Manufacturing Company, Milwaukee, Wis.

The New Nordberg Power Jack Weighs Only 1025 Lb. and Uses Hydraulic Plungers for Its Lifting Action

The new power jack, which weighs 1025 lb., is similar in design to former models, with the exception that the lifting action is secured by hydraulic plungers actuated by oil at high pressure obtained from two high pressure pumps driven by a 6½-hp. air-cooled gasoline engine. Because of

its lighter weight, it can be moved more easily from lift to lift and removed from the track more quickly, making it suitable for working on track under traffic and under conditions which were unfavorable to the heavier model that it has replaced.

New Buda Jacks

TWO new jacks, the No. 2215-S automatic lowering jack and the No. 5012 ball bearing journal jack, have been developed by the Buda Company, Harvey, Ill. The 2215-S is an all-purpose rachet-type jack designed for heavy-duty outside work, such as bridge and building or track work, pole pulling and lifting or moving heavy equipment, etc. It has a capacity of 15 tons with a 13¼ in. rise, and a height closed of 22½ in. The reversing lever is conveniently located where it can be changed quickly by merely pushing it with the hand, foot or lever bar. A double lever socket provides for raising or lowering with the lever bar in the most convenient position, and a toe lift is provided for track work, or other low lifting requirements. The jack is mounted on an extra-heavy hinged base with a large grooved bottom, which permits the jack to be tilted for special work. It is equipped with a chain type cap and a five-foot chain. The chain has one lift hook and one grab hook and its use permits lifting objects below the base of the jack.

The No. 2215-S Automatic Lowering Jack Has a Capacity of 15 Tons

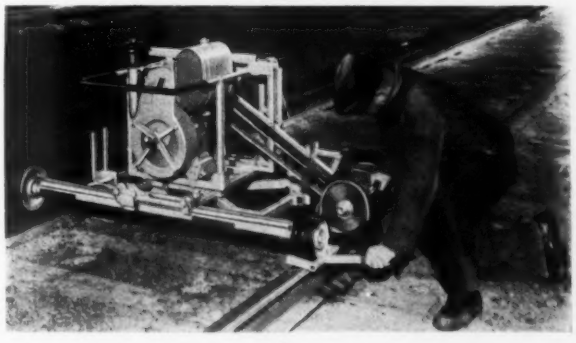
The No. 5012 ball-bearing journal jack is designed for heavy-duty work and is adapted to bridge and construction work, handling heavy machinery, etc. This jack is simple and compact in design. It has a capacity of 50 tons, a height closed of 12 in., a rise of 6 in. and weighs 80 lb. As the name implies, the lift screw is mounted on ball bearings, which provide for easy operation. Several other outstanding features of this jack include a safety retarding spring which prevents creeping or accidental lowering while the jack is under load, a built-in "Postop" feature which prevents the ram from being raised beyond the safe limit when lifting a load, and the rachet and lifting panel are totally enclosed and packed in grease. The 5012 is simple and easy to operate and may be operated in any position.

The Buda No. 5012 Ball-Bearing Journal Jack Has A Capacity of 50 Tons

Nordberg Flexible-Arm Grinder

A NEW development in rail grinding equipment of the Nordberg Manufacturing Company, Milwaukee, Wis., is the Flexible-Arm grinder, a machine which will do the wide variety of track grinding jobs ordinarily done by a grinder with a flexible shaft, including such jobs as rail-end slotting, removing flow from switchpoints and stock rails, grinding frogs, crossings, etc. The use of the flexible arm has a number of advantages. It is exceedingly fast and accurate, and the arm is so flexible that the entire rail structure, including switches and crossings, can be reached by the grinding wheel.

The Flexible-Arm grinder has a 6½-hp. air-cooled gasoline engine which drives the grinding wheel at the end of a flexible arm by means of a belt and pulleys. The entire unit is mounted on a four-wheel frame and is fully equipped with 16 sealed ball bearings of the cartridge type. When equipped with a thin wheel, the grinder is used for rail end slotting, or for grooving rails at seldom-used turnouts for the insertion of copper for better signal operation. With an 8-in. by 1-in. grinding wheel, it can be used for grinding frogs and flangeways which have been reconditioned by welding. For removing flow at switchpoints and stock rails, a double-faced cupwheel is used. By means of a simple adjustment, the cupwheel can be set to undercut the stock rail to house or protect the switchpoint.



The Nordberg Flexible-Arm Grinder Can Be Used for a Wide Variety of Track Grinding Jobs

New Arc-Welding Electrodes

THREE new shielded-arc electrodes, Types W-30, W-83, and W-93, for specific types of arc welding work, have been developed and put on the market by the General Electric Company, Schenectady, N. Y., as additions to this company's extensive line of electrodes. All three of the new types are heavily coated and can be used with direct or alternating current.

The Type W-30 is an A.W.S. E-6012 all-position electrode, especially designed for use where high currents are desired for high-production speed on lap or fillet welds. The ability of this electrode to carry high currents leads to a substantial reduction in stub-end losses which result ordinarily from the use of such currents.

The Type W-83 electrode is designed especially for use in the fabrication or repair of cast iron. It is an all-position electrode and its outstanding advantage is its ability to operate at relatively low currents, a desirable condition for cast iron.

The Type W-93 is designed for building up steel surfaces to resist wear from shock, abrasion and rolling

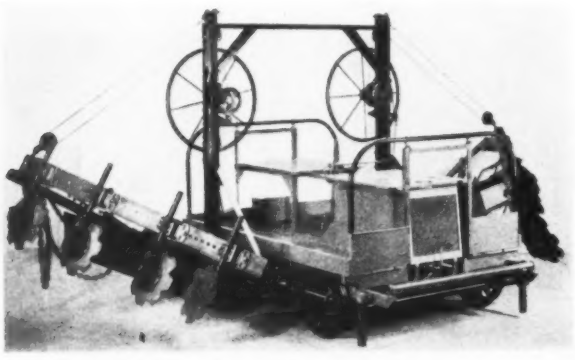
impact. Its smooth arcing characteristics, freedom from spatter, and wide coverage (74 sq. in. per lb.) adapt it especially for such applications as building up battered rail ends, snowplow shoes, crawler-type tractor wheels and treads, and scraper blades.

Fairmont M25 Series D Ballast Discer

MANY improvements have been made in the M25 Fairmont ballast discing machine to increase its sturdiness and simplicity and make it more effective. The M25 series D, the latest model of these machines, has eight cutaway discs, four on each side of the unit, which cut into and break up the ballast, improving drainage, killing weeds, re-establishing a sod line and improving the uniformity and appearance of the ballast shoulders. Adjustment of the discs along the diagonal disc beams can be made easily and each individual disc can be spaced and turned as desired to adapt the machine to varying conditions. Specially designed knuckle joints have been placed on the inner ends of the discer beams to compensate automatically for the average variation in the ballast contour. These knuckle joints permit the inner ends of the disc beams to move within a limit of 5 in., while the outer end of the beam is held in constant position, thus allowing the discs to follow the contour of the ballast and keep working at a uniform depth.

The M25 series D is effective in cinder, earth or gravel ballast. It operates on both sides of the track at the same time and usually one trip is all that is necessary, especially if the ballast shoulder has been worked previously. On main line tracks, however, with pit run gravel ballast and with an uneven contour of the ballast shoulders, two trips over the track will give a more finished appearance and a better distribution of the ballast. Once the shoulder has been properly worked, single trips at regularly spaced intervals are unusually all that is required thereafter.

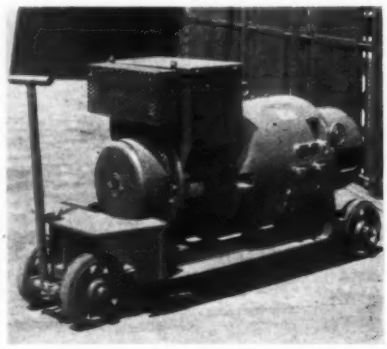
The M25 series D is usually pulled by an A5 series C gang car fitted with heavy duty drive wheels. A crew of three men, a motor car operator and two helpers, can operate the unit. The helpers operate the discing beams, which are easily raised or lowered by two large hand wheels. Foot-operated brakes hold the beams in position.



The Fairmont M25 Series D Ballast Discing Machine Is Effective in Cinder, Earth or Gravel Ballast

Special Slim Welder for Elevated Work

AN interesting example of a specialized portable welding generator developed for use on elevated and subway tracks on a large urban transit system in the East, which made welding 100 per cent available without interfering with normal train operation, was recently made by the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.



The Slim-Welder Rebuilt to Fit on An Elevated Catwalk

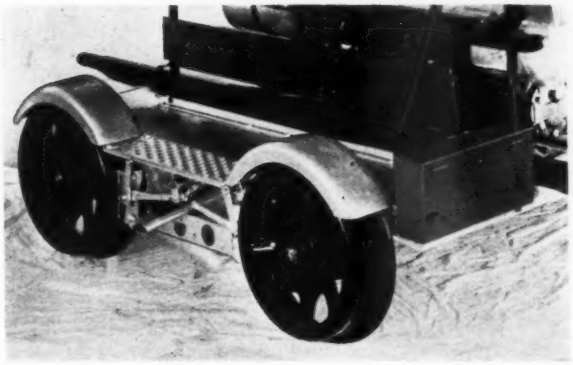
For this particular job a slim welder which could be placed on the catwalk of the elevated structure for emergency work near by had to be designed with a width of not more than 22 in. Also the electrical design had to be such that the set would operate satisfactorily from the 600-volt d.c. third rail traction power at any point along the line, regardless of the heavy electrical surges occasioned by the stopping and starting of nearby traffic, and a method of connecting the welder to the third rail and one of the track rails in a manner so as not to interfere with the wheels and third rail shoes of the cars had to be devised.

Providing a welder with a width of only 22 in. was principally a mechanical problem. It was determined that the width of a bare motor-generator set of the rating desired was 22 in. The standard portable set of this rating had a width of 6 in. too wide because the rear wheels were so arranged that they extended approximately 3 in. on each side of the welder proper. In order to comply with the width restriction of the catwalk, it was decided to reduce the size of the wheels and then raise the welder enough for clearance. Since the bare set weighs 1800 lb., stability was accomplished by using two wheels instead of a single 11-in. wheel on the front end. To obtain a workable turning radius with the front wheels, it was necessary to move them forward. The result of this change is that the welder can be turned on a radius of 58 in., its wheel base. By the use of a special welded angle-iron underframe, the job was made sufficiently rugged to endure the rough usage it encounters in this service.

Maintenance work on an elevated train structure must be done under very unfavorable vibration conditions. Operators of this set say that every desirable welding characteristic is maintained even under unfavorable conditions. The average elevated-structure maintenance job involves not only welding but also cutting. Experience shows that when this machine is set for full 300-ampere capacity, ¾-in. metal can be cut without trouble. To avoid the trouble of carrying both carbon and metal electrodes for cutting and welding, metal electrodes are used for either.

Wide Wheel Guards and Step Plates

INSPECTION cars of Fairmont Railway Motors, Inc., Fairmont, Minn., have recently been equipped with new wide steel wheel guards and step plates, which effectively safeguard against contact with the turning wheels and also provide complete protection from water thrown up from wet rails. The wheel guards and step plates are die-stamped from pressed steel and weigh one-fifth less than those formerly used. They are applied to the inspection car by bolting to the frame and may be installed readily to replace old parts. The step

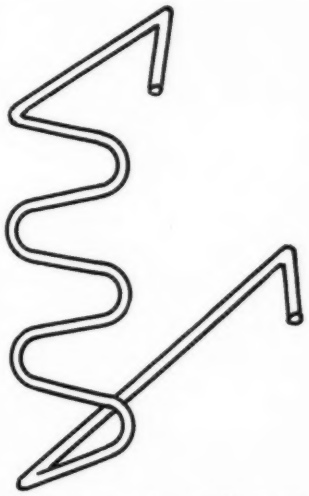


Close-Up View of an inspection Car Equipped with the New Wide Wheel Guards and Step Plates

plates have a specially designed, non-skid diamond tread, which insures safe footing for the men who operate the cars. The new wide wheel guards and step plates are now standard equipment on the M9 series C and D, the M19 series D and E and the 59 series C and D cars.

Improved Retainer for Joint Packing

THE Railway Maintenance Corporation, Pittsburgh, Pa., has improved the design of the retainer placed in the



Drawing of a Joint Packing Retainer Showing the Hooks on the Legs

joint packing in the space between the joint bar and the web of the rail to help hold the packing in place and prevent any of it from jarring out at the ends of the joints. The retainers were formerly designed as a grid-shaped wire with two legs that extended into the plastic and depended for its holding power upon the skin friction of the wire legs in the plastic. The new wire retainers are designed with the ends of the legs bent back in a hook, making an angle of 45 deg. with the remainder of the leg. They are easy to apply in the fresh joint packing between the joint bar and the rail and the hooks effectively prevent their working out. The grid portion of the retainer between the legs of the retainer at the ends of the joints prevents that portion of the packing which may have hardened due to exposure to the air from being shaken or jarred out under traffic.

Traxcavator in Heavy-Duty Model

THE Trackson Company, Milwaukee, Wis., has recently added to its several smaller models of Traxcavators, or front-end loading attachments for crawler-type tractors, its Model T7 Traxcavator, a heavy-duty, large-capacity unit, equipped with buckets of 2 or 2½ cu. yd. capacity. This new model, which is designed for use with a Caterpillar D7 (75-hp. Diesel) tractor, like the smaller units, combines in one machine the usefulness of a shovel, loader, scraper, bulldozer, angledozer and trailbuilder. With these characteristics, the machine has wide application in many classes of roadway construction and maintenance work, including ditching, bank widening, right-of-way sloping, etc., either carrying its own loads to points of disposal, or loading them into trucks.

The T7, which is said to have powerful cutting action, enabling it to dig in the toughest soils, and even shale, has a lifting height of 10 ft. above the ground, with a dumping clearance of 8 ft. The 2-yd. bucket furnished with this unit is 75 in. wide, while the 2½-yd. bucket is 96 in. wide.

For especially difficult excavation, the bucket can be equipped with special heat-treated alloy steel teeth. Also, a bulldozer or anglegrader can be supplied with the unit, either of which can be quickly substituted for the bucket for special classes of work.

The Model T7 Traxcavator, Equipped With a 2 or 2½-Cu. Yd. Bucket, Has a Lifting Height of 10 Ft.

New ¼-In. Skildrill

SKILSAW, Inc., Chicago, has recently produced a new ¼-in. electric Skildrill which is exceptionally light in weight and is said to be particularly suitable for fast production drilling and for all ¼-in. drilling in maintenance work. The Skildrill weighs only 2¾ lb., is 6⅝ in. long overall and 2-9/16 in. wide. It is a pistol grip type of drill with a die-cast body and

The New ¼-In. Skildrill

is equipped with complete anti-friction ball and needle roller bearings, a universal motor, helical-cut gearing throughout and a two-pole momentary contact switch with a lock for continuous operation. It has a no-load speed of 1800 r.p.m. and a full-load

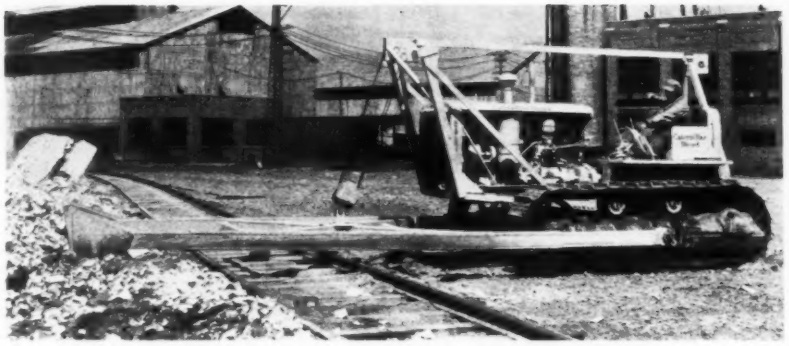
speed of 1050 r.p.m. The drill has a drilling capacity of ¼ in. in steel and similar metals and ½ in. in wood.

Tractor Attachments Simplify Dump Work

FACED with the problem of constantly shifting track on the dump at its plant at Canton, Ohio, and of leveling off piles of refuse on the bank side before the track could be shifted, plant engineers of the Timken Roller Bearing Company have developed two highly effective attachments for one of their D8 Caterpillar tractors for doing both of these classes of work. Formerly, the tractor, equipped with a LeTourneau Model D-4 bulldozer, was used quite effectively for these operations, but had certain limitations in that it was necessary for the tractor to work on and over the track in bank-leveling operations, and that there was no provision in the tractor-bulldozer arrangement for lifting the track off its old bed when shifting it, which made shifting difficult.

For the bank-leveling operation, without the necessity of the tractor encroaching on the track, a special bulldozer was developed, employing a Model D-4 LeTourneau blade, but with arms 23 ft. long. With this unit, supported from the same overhead rigging on the tractor employed for the standard bulldozer, and, like the standard unit, cable-operated and controlled, all of the dozing work can be carried out with a clear reach across the track, without encroaching on it, the cutting edge of the dozer being approximately 17 ft. in advance of the front of the tractor tracks.

The other attachment developed to simplify the shifting of the track over the leveled dump consists essentially of two heavy steel plate hooks, or shoes, set vertically and fixed securely in this position about two feet apart by welded-in struts between them, this unit as a whole being hooked on the front of the standard D-4 bulldozer blade, over the top edge. With specially curved and notched lower ends designed to reach under, lift and push

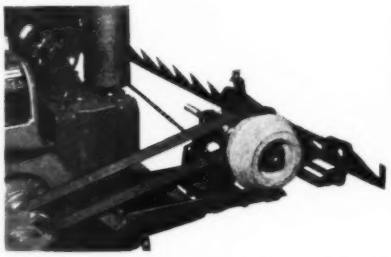


The Long Bulldozer Attachment Has Arms 23 Ft. Long

against the far rail of the track at the same time, the tractor, with its attachment, while clear of the track itself, can give it a lift and push simultaneously, throwing it over on the widened dump, with only a fraction of the effort required formerly. While the track-shifting shoe is designed essentially for lining the track forward on the dump, it is so designed and hooked to the cutting edge of the supporting dozer that it can be used to heel the track backward, if desired.

Power Sickle Grinder for Weed Mower

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has developed a power sickle grinder attachment, which can be quickly attached to the



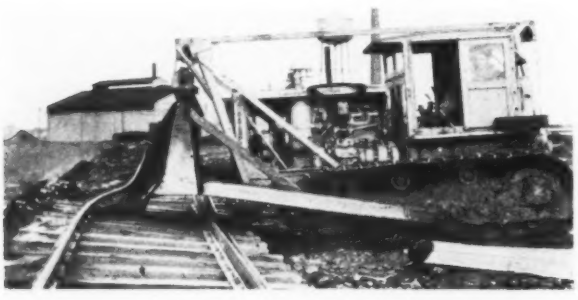
Close-Up of the Power Sickle Grinder Attached to a Weed Mower

right hand power head of the Fairmont M24 series-E mowers for sharpening the sickles. The grinder consists of a double bevel-face sickle cone, mounted on a bracket which is attached to the mower, a 1½-in. belt, and a special engine pulley with starter sheave. A sickle-holder is attached to the bracket, which supports the sickle firmly, so that the operator needs only to move the knife sections over the face of the beveled grinding wheel, which produces uniformly ground edges from the tip to the heel of the sections. About six sections can be ground before it becomes necessary to unclamp the holder and slide the sickle along. When the sickles have been sharpened, the grinder can be quickly detached and stored in the tool box of the mower until sharpening is again required.

Combination One-Man Track Tool

THE Cartier Supply Company, Chicago, has placed a light-weight, one-man combination track tool on the market which can be used as a rail lifter, a track liner and a tie spacer. The tool consists of a wooden handle with steeel side brackets bolted on one end and two assembly pins with cotter keys, which are used for applying the accessories which adapt the tool for its various uses. The tool utilizes the principle of a simple lever in all of its operations. All of the metal parts and accessories are of electric cast steel fully annealed, except the tie spacer bracket and shims, which are of 0.50 carbon alloy steel heat-treated to a hardness of 245 Brinell, and the steel pins, which are of high-carbon heat-treated steel.

When used for lifting rails, a rail hook, which fits over the ball of the rail from the side, is applied to the end of the handle and a lifter shoe is attached near the end. The lifter shoe has an adjusting screw to adapt it to any height of rail. In its application, the rail hook is placed against the ball of the rail, with the lifter shoe bearing on a crosstie on which the spikes have been raised. A downward force on the

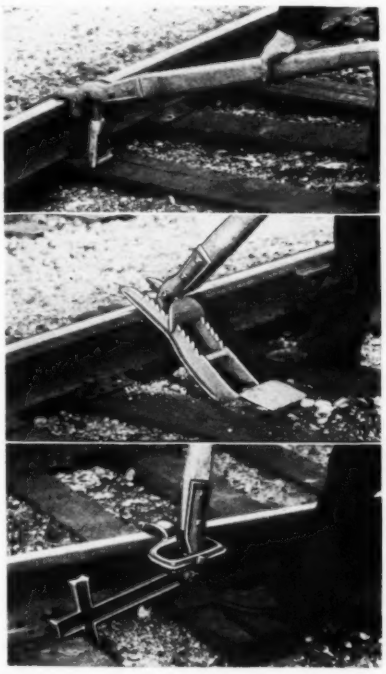


The Track Shifting Attachment Lifts the Track as It Throws It

end of the handle lifts the rail. As a rail lifter, the tool can be used for such jobs as shimming track or removing shims and inserting or removing tie plates. It can also be used in place of a jack when picking up low spots, by raising the rail and tamping the adjacent tie. In crosstie renewal work, the rails can be raised on a tie adjacent to the tie being renewed and spikes placed between the rail and tie plate to hold it up until the old tie is removed.

When used as a track liner, the rail hook and liner pawl are attached to the handle, and a separate steel piece, called the liner rachet, which serves as a base for the liner, and which has teeth to engage the liner pawl, is also used as a tie spacer, a spacer bar, shaped in the form of a cross, is attached to the end in place of the rail hook and a spacer bracket is also attached to the handle near the end. Part of the spacer bracket extends out at right angles from the handle and is shaped to fit over the ball of the rail. When spacing ties, the lower arm of the spacer bar is placed against a tie to be moved and the spacer bracket is placed over the ball of the rail with the handle in a nearly vertical position. Because of the difference in the size of various rail sections, and also to compensate for wear, shims are inserted betwen the spacer bracket and the rail head to provide a snug fit. A pull backward on the handle then forces the spacer bar forward, pushing the tie to the desired location. If the tie must be moved further, the spacer bracket is moved forward and the action repeated.

It is said that while this tool is light, it will raise or line any weight of track, that it can be used to replace many heavy tools on the section motor car and that it will enable a skeleton gang to do work that would otherwise require a large gang. The tool is not fastened to the track in any of its operations and can be quickly removed. It does not slip or kick out of place and can be quickly adapted to perform any of its various functions.



Above—Showing the Position of the One-Man Track Tool for Raising the Rail. Center—The Tool in Position for Lining Track. Below—Spacing a Tie

used. In lining track, a hole is dug in the ballast about 16 in. from the rail with the tine ends of the liner rachet, which is then placed against the rail with the base in the hole and the rachet teeth uppermost. The rail hook on the handle is placed against the ball of the rail between the tines of the rachet with the rachet pawl engaging the rachet teeth. A downward movement on the handle then moves the rail slightly upward and outward. The handle is then lifted, the pawl engages another set of rachet teeth, and the action is repeated. In a similar manner, the tool can be used for gaging, to force the rail against the gage after the inside rail spikes have been pulled.

When the tool is equipped to be

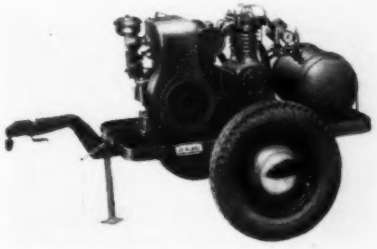
Off-Track Mounting for Syntron Power Unit

THE Syntron Company, Homer City, Pa., has mounted its four-tool power unit on a two-wheel chassis, equipped with pneumatic tires and designed to adapt this motor-generator unit for off-track operation. The unit has a wheel gage of 27 in. and weighs 950 lb. It is equipped with handles on the sides and at both ends and is designed for hand movement along the track by one or two men, depending upon the shoulder or surface conditions. Ordinarily it requires only one man to move it as the work of the gang progresses. It is said that with the new mounting, the power unit can be moved over signal leads, switch leads, etc., without any trouble by the number of men available in the ordinary section gang.

The New 4-Tool Syntron Portable Power Unit Has a Two-Wheel Rubber-Tire Mounting

Air Compressors for Spray Painting

TWO improved series of four- and six-hp. portable air compressing outfits for the operation of two and three spray painting gun outfits, have been released by the DeVilbiss Company, Toledo, Ohio, which are suitable for railroad bridge, building and structural painting.



A DeVilbiss 6-hp. Air Compressing Outfit on a Pneumatic-Tired Trailer Mounting

Both 4-hp. and the 6-hp. units consist essentially of an air-cooled gasoline engine connected by a V-belt drive to a ball-bearing 2-cylinder air compressor and an air tank mounted on an all metal base, except that the 6-hp. unit may be ordered with a special water-cooled gasoline engine and an electric starter. Both types of units are available in 20 different types of mountings, consisting of skid, truck and trailer models, with pneumatic or steel wheels.

The TS and TD, 4-hp. compressing outfits, without any special mounting are 61 in. long, 23 in. wide and 31 in. high and weigh 570 lbs. The air compressor on these models has a working pressure of 80 lbs., a displacement of 23½ cu. ft. per min. and an actual delivery of 17 cu. ft. per

min. The compressor is equipped with an automatic unloader, after-cooler and air filter. The air tank on these units is cylindrical, 14-in. by 22-in., has a capacity of 11.6 gal. and is equipped with a pressure gage and outlet drain and safety valves.

The TNS and TN, 6-hp. compressing outfits, without any special mounting, are 61 in. long, 28 in. wide and 30 in. high and weigh 700 lbs. The air compressor on these models has a working pressure of 80 lbs., a displacement of 34.4 cu. ft. per min. and an actual delivery of 25.4 cu. ft. per min. The compressor is also equipped with an automatic unloader, after-cooler and air filter. The air tank on these units is the same as on the 4-hp. units and similarly equipped.

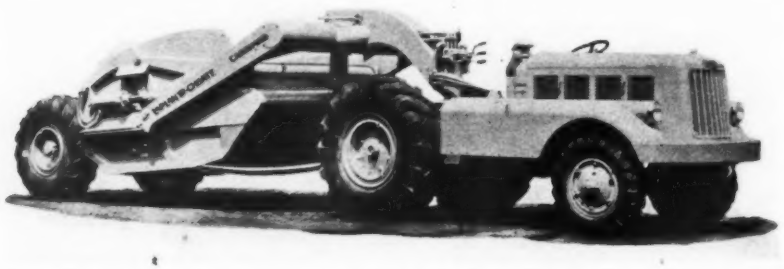
High-Speed, Long-Haul 10-Yd. Tractor Scraper

THE latest addition to the extensive line of earth-moving equipment developed by the LaPlant-Choate Manufacturing Company, Inc., Cedar Rapids, Ia., is its CW-10 Carrimor scraper, an excavating, hauling and dumping unit, which is adapted to a wide range of railway earth-moving operations. This unit, with a heaped capacity of 10 cu. yd. and a struck capacity of 8.75 cu. yd., is pneumatic-tire mounted, and is designed especially for use with a Caterpillar, Diesel DW-10 wheel tractor, a high-speed unit designed specifically for long-haul operation.

The CW-10, like other Carrimor models of larger or smaller capacity, has a sturdy bowl; a narrow cutting edge, with flat loading angle, which tends to cut into the ground during loading, rather than be lifted from it; a high-lifting front apron; and a positive push-out gate. Furthermore, the bowl bottom and cutting edge are curved to facilitate loading, and the lower edge of the apron is curved to fit the bowl bottom, precluding the loss of material.

This model is hydraulically-controlled throughout, including independent operation of the apron, push-out gate and cutting edge, and its brakes are of the internally-expanding, Bendix hydraulic self-energizing type. Other features of the unit are it has no over-head obstruction, and a wheel arrangement set within the bowl assembly width so that the wheels are always inside the cut.

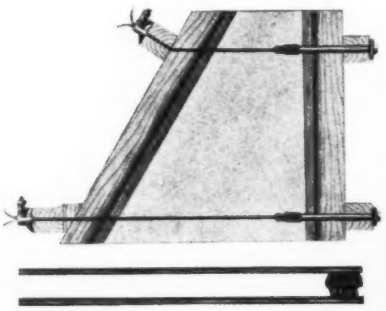
By the addition of a front wheel assembly and a change in location of the hydraulic controls, the CW-10 Carrimor is adapted for use with a Caterpillar Diesel D7 crawler-type tractor, and in this arrangement is known as the Model TW-10.



The CW-10 Carrimor Scraper, Coupled to a Caterpillar Diesel DW-10 Wheel Tractor

Richmond Flex-Ty for Concrete Form Ties

THE Richmond Screw Anchor Company, Inc., Brooklyn, N. Y., has developed a new type of concrete form-tying device named Flex-Ty. Flex



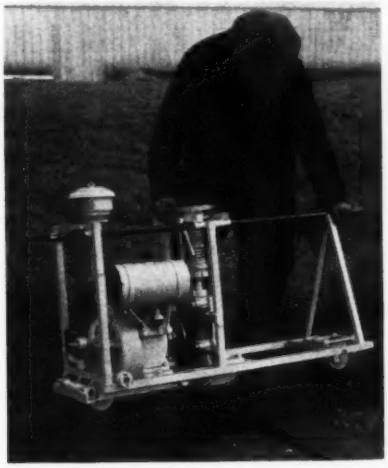
Above—Showing Flex Ties Installed in Forms. Below—Plan View of a Flex Ty

Ties each consist of two strong cold drawn wires, with a guaranteed strength of 5000-lb. safe load per Ty without slip or stretch and an ultimate strength of 8000 lb. The wires at one end of each Ty are welded to a preformed helix (wire coil nut). In assembly, a lag screw which fits the helix and a flat washer hold one end of the Flex-Ty and the two wires are held by a special clamp at the other end. Holes are drilled in the forms and form studs for the lag screw at one end and the wires of the Flex Ty at the other end. The clamp is especially designed with a hardened wedge-shaped bolt, the head of which bears against the two wires when the nut is drawn tight.

Flex Ties are made in even ½ ft. and foot lengths, beginning at 3 ft. They are said to be light, fast and easy to install and strip. They meet specifications which require that the Ty end must be set back from the exposed wall face. They eliminate rod couplings, rod pulling and chipping back in the exposed surface of the concrete. Flex Ties are said to be ideal for form work on walls of varying thicknesses. The clamp, when drawn up tight, will not slip or stretch.

Nordberg Midget Grinder

A MIDGET grinder, which is light in weight and which can be removed and replaced on the track by one man, has been placed on the market by the Nordberg Manufacturing Company, Milwaukee, Wis. The principal uses of the machine are for grinding welded rail ends, removing mill tolerance,



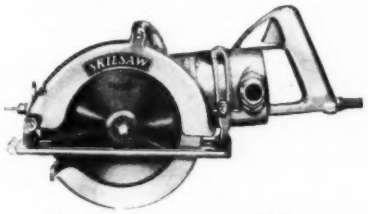
The Nordberg Midget Grinder Is Light in Weight and Can Be Easily Handled by One Man

leveling cropped rail and grinding out rail corrugations and wheel burns. Its compact design and the ease with which it can be handled, make the Midget grinder especially suitable in dense traffic areas. The machine consists essentially of an 8-in. cup grinding wheel which operates in a horizontal plane, driven by an air-cooled gasoline engine, the entire unit being mounted in a frame with a flanged roller at each end. In operation, the grinder is rocked from side to side and at the same time moved back and forth along the rail. It is said that for

the type of grinding for which the Midget grinder is adapted, it will provide an accuracy and smoothness of finish surpassing that secured with any other type of grinder.

Model 825 Skilsaw

A PORTABLE 8¼-in. electric saw, Model 825, has been added to the line of portable electric tools manufactured by Skilsaw, Inc., Chicago, which is adapted to fast cutting in building, remodeling and maintenance work;



The Model 825 8¼-In. Skilsaw

for cutting wood, steel, lead, copper and aluminum and, when fitted with abrasive discs, for cutting or scoring stone, tile, concrete, etc.

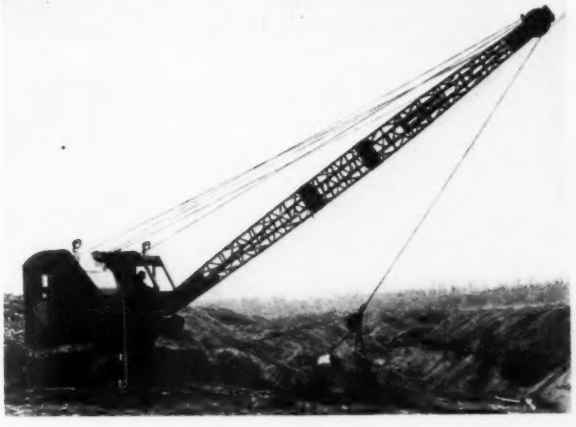
The model 825 is 18 in. long, weighs 18½ lb., and is powered with a universal electric motor. The blade has a free speed of 3000 r.p.m. and is protected by an automatic telescoping guard that rotates on ball bearings. All moving shafts of the saw are also mounted on ball bearings. The saw will cut to a depth of 2⅝ in. in wood, will cut aluminum and copper up to ½ in. thick and lead sheets up to 1 in. in thickness.

New Gasoline-Engine Driven Chain Saw

THE Mall Tool Company, Chicago, has recently placed a new gasoline-engine driven chain saw on the market. This saw is similar to other chain saws manufactured by this company, with the exception that it is powered by a four-hp. one-cylinder gasoline engine mounted on one end of the saw by a swivel arrangement which permits the saw to be operated at any angle without tilting the engine. The engine, which is air-cooled by a flywheel fan and has a high tension magneto ignition, is started by a pulley-cord arrangement. It is connected to the chain saw by a multiple dry-disc clutch and a transmission of hardened bevel gears, with a 4-to-1 ratio, running in oil. The saw chain is constructed of special heat-treated saw steel and is oiled by a built-in pump in the idler housing. The entire unit is available with chain saws 24 in., 36 in. and 48 in. long, weighing 103, 108 and 115 lb. respectively.

Link-Belt Speeder LS-60

ONE of the most recently developed products of the Link-Belt Speeder Corporation, Chicago, is the LS-60 ½-cu. yd. convertible crawler dragline-shovel-crane, a heavy-duty machine which is said to be especially adaptable to railroad needs as an off-track maintenance unit.



The LS-60 Dragline Is Adapted to Off-Track Maintenance Work

The LS-60 weighs approximately 31,000 lb., and is powered by a 6-cylinder heavy-duty gasoline engine rated at 60 hp. at 1250 r.p.m. The unit has two crawler speeds, 0.84 m.p.h. and 2.2 m.p.h., and a swing speed of 5 m.p.h. Equipped as a dragline, it has a 30-ft. boom and a ½-cu. yd. bucket. The dragline has a hoist speed, single line, of 180 ft. per min., and an inhaul speed of 145 ft. per min. Equipped as a shovel, it has a 17-ft. boom, a 13-ft. dipper stick and a ½-cu. yd. bucket. The shovel has a hoist speed, single line, of 180 ft. per min., a chain crowd speed of 100 ft. per min., and a retract speed of 150 ft. per min. Equipped as a crane and clamshell, it has a 30-ft. boom and as a trench-hoe, a 16-ft. boom with a 7 ft. 6 in. dipper arm with a maximum reach of 28 ft. The crawlers are smooth, non-clogging and provided with recoil springs. The standard track shoes are 16-in., of the lug-driven type, and 20-in. or 24-in. track shoes are optional.

A number of improvements are claimed for the LS-60 as compared to previous models, which include self-aligning roller bearings on drum shafts, reverse shaft and main power shaft; a new safety-type rapid boom hoist for crane duty, with conventional worm-geared boom hoist optional; fully enclosed traction gears running in oil; a 56-in. machine-finished roller path turntable with roller bearing hook rollers; interchangeable clutches on the drum, swing, retract and boom hoist, welded steel design for strength and resistance to shock load and to provide positive alignment of machinery parts, and glass windows all around the operator's cab to provide good visibility.

It is said the machine is exceptionally sturdy in construction and has ample reserve power, that it may be quickly converted from one attachment to another without mechanical alteration, that it has simple positive steering and ample ground clearance, and that it has greater mobility because of the two crawler speeds.

The New Mall Chain Saw, Powered with a Gasoline Engine

Universal Mobile Water Tank Units

THE Universal Paper Products Company, Chicago, has placed on the maryet a new Mobile Water Tank Unit which eliminates the unsanitary bucket and dipper method of dispensing water and which is adapted to railroad bridge, building and track work.

The Universal Mobile Tank Units Eliminate the Unsanitary Bucket and Dipper Method of Dispensing Water

The Universal Mobile Water Tank consists of a large rectangular tank made from lightweight metals, with a curved side to fit the carrier and fitted with adjustable shoulder straps, a paper cup dispenser and a faucet. A large mouth on the tank permits quick filling and easy cleaning. The tank is made in two models, the 500 and the 500-J. The only difference between the models is that the 500-J has a canvas jacket with a hair-felt lining which serves both as insulation and as a padding for the carrier's comfort. A variety of sizes and shapes in paper cups are available for use with the water tanks.

It is said that tests on construction work with the Universal Mobile Tank Units have shown that they save the time of the workers going to and from stationary water supplies.

Improved Insulated Gage Rods

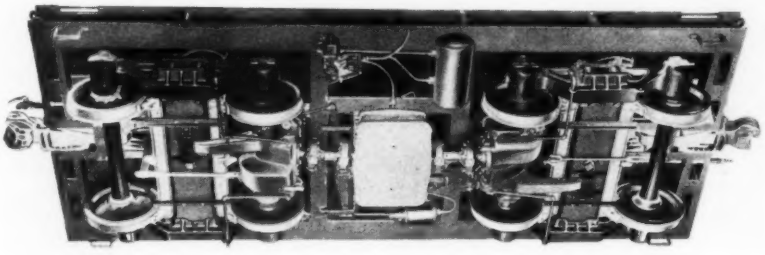
THE Oliver Iron and Steel Corporation, Pittsburgh, Pa., has re-designed its center-insulated gage rods to effect a better balance and provide greater strength with less weight. The change in design has been made in the center insulated joint. These joints are now equipped with four ⅝-in. diameter high carbon heat-treated bolts instead of the ¾-in. diameter commercial grade bolts formerly used and in addition the design of the forged section of the insulated ends of the rods has been changed to provide slightly beveled sides, rounded corners to effect a better balance, less weight and a more streamlined appearance.

American Locomotive Cranes

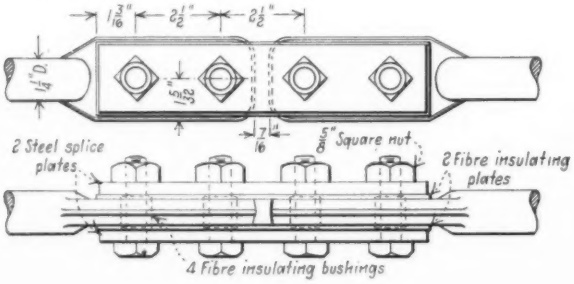
THE American Hoist & Derrick Company, St. Paul, Minn., has completely redesigned its line of American Locomotive Cranes to improve their power and time-saving features, to reduce wear and maintenance costs and provide safer operation. The car body, travel mechanism and trucks of the new cranes are designed to provide for housing the three-speed transmission under the car body instead of on the deck. The transmission and drive shaft gears are fully enclosed, with the gears running in oil. The car body is of heavy-duty welded construction, with one-piece rigidity and the trucks are free to swivel around sharp curves or weave over rough track, with the gear teeth remaining in full engagement. This latter feature, and the fact that all gears are completely enclosed, is said to account for low maintenance costs on the travel mechanism of these cranes

Another outstanding feature of the cranes is the full width mast design, which permits all the machinery on the deck to be removed without removing the mast. The deck machinery is also designed for maximum accessibility. These features are said to be a great convenience and to save time and expense in maintenance and repair work. Two other features are anti-friction bearings, built to last during the life of the crane, and to eliminate the cost of replacing bronze and babbit bearings, and air-controlled twin-disc clutches, which are easy to operate, eliminating operator fatigue and speeding up production, and which permit the boom to be raised and lowered while traveling. Safety features include a clearance of 14 in. between the bottom of the revolving deck and the top of the car body, a full view of the work from the operators seat, shielding of all moving machinery on the deck, and cab doors which slide instead of swing, keeping clearances within standard limits.

American locomotive cranes are made in four models with gasoline, Diesel or Diesel-electric power, having capacities of 25, 30, 35 or 40 tons and four models with steam power, of 20, 25, 30 and 35 ton capacities.



A View of the Bottom of An American Locomotive Crane Car Body, Showing the Trucks, and Fully Enclosed Transmission and Drive Shaft Housings

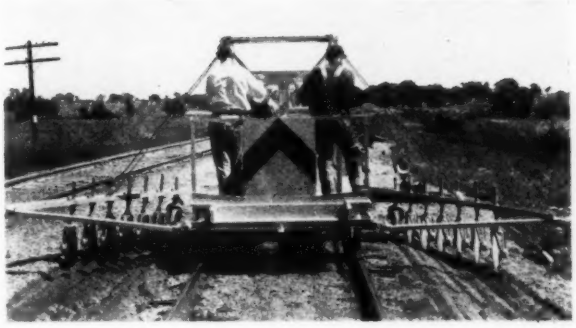


Plan and Side Elevation of the Splice Assembly of the New Gage Rods

Kalamazoo Discer

FOR the purpose of destroying weeds in the ballast shoulder, maintaining a definite grass line, and facilitating roadbed drainage generally, the Kalamazoo Railway Supply Company, Kalamazoo, Mich., has put on the market the Kalamazoo No. 38D power discer, a power-car unit with rigidly supported discing arms on each side which can be raised and lowered by a hand or wheel crank.

The power car is a four-wheel motor car equipped with a 4-cylinder water-cooled engine capable of developing 40 to 50 hp., and is arranged with drives on all four wheels, utilizing the entire weight of the car for traction. When not used in discing operations, the car, readily stripped of its discing apparatus, can be used as a heavy-duty motor car for other classes of maintenance work.



The 38D Discer Is Powered by a 40 to 50 HP Engine

Each of the discing arms of the new unit is equipped with seven, 16-in. discs, of a special wear-resisting steel, each revolving on Timken tapered roller bearings protected by dirt-proof oil seals. Each disc can be adjusted readily as to height or angle, and the discing arms as a whole can be quickly raised and lowered by two worm drive winches, operated by the crank wheels.

Car-Mounted Crane Speeds Concrete Work

RECENTLY, a rather unique crane-tower arrangement on a flat car was used most effectively in placing the concrete in the floors of a two-story ordnance plant building, 1200 ft. long, at St. Louis, Mo. In this set-up, a multiple-chute tower, 45 ft. high, and a Bay City, crawler-mounted, ¾-yd. Diesel crane, with a 50-ft. boom, were mounted on a 50-ft. flat car and used in combination to handle concrete from truck mixers at the ground level, directly into place in the building floors; the entire plant being moved along as work was completed.

The tower, of frame construction, had a receiving hopper and bin at the top, and was equipped with two chutes, one extending to the first floor and the other to the second floor. Concrete was delivered to the site in truck mixers, which were run up on a timber ramp, where they dumped directly into a 1-yd. bottom-dump concrete bucket. The bucket, in turn, was picked up by a single line of the crane and raised to dumping position over the tower bin.

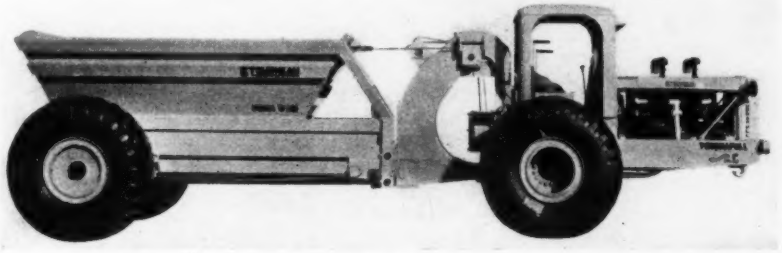
With a track continuously along the new building site, the concrete plant as a whole was moved forward as the work progressed, employing a dragline cable on the front drum of the crane for power, and anchoring it to the rail head. With the long reach of the 50-ft. crane boom, it was necessary to move the truck mixer ramp only at infrequent intervals in order to bring the concrete bucket within reach, but when this became necessary, it was shifted to its new location by the crane in a few minutes time, and without difficulty.

With this set-up, as much as a yard of concrete a minute was placed continuously during repeated 9-hr. shifts, speeding up operations over what had been anticipated, and lowering costs. The arrangement described was set up by the Fruco Construction Company, employed on the plant construction.

The Car-Mounted Crane and Tower Afforded a High Degree of Flexibility to the Concreting Work

New, Large-Capacity Earth Hauling Unit

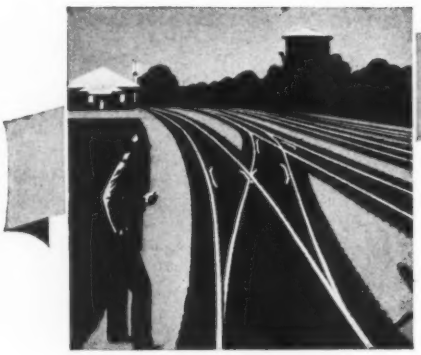
IN order to utilize fully the power and speed of its Super C Tournapull, R. G. LeTourneau, Inc., Peoria, Ill., has introduced what it designates as the W 210 Tournatrailer, with a heaped capacity of 17 cu. yd. This unit, pneumatic-tire-mounted, has been designed with flared side and end walls to give the bowl an 8-ft. by 12-ft. 8-in opening at the top for quick, accurate loading by large-capacity draglines or shovels.



The LeTourneau Super C Tournapull—W 210 Tournatrailer Combination Has a Heaped Capacity of 17 Cu. Yd.

The W 210 Tournatrailer is powered by the 150-hp. Super C Tournapull for fast pick-up and travel, quick spotting and easy maneuvering. Four forward speeds of this unit—2.6, 4.4, 8.1 and 14.3 m.p.h., and a reverse speed of 2.2 m.p.h., afford travel speeds for all job conditions. The two tires of the Tournatrailer are 21.00 x 24, and have 20 plies—the same size employed on the Super C Tournapull.

Other features of the W 210 Tournatrailer include a self-cleaning, sliding bowl that gives end-dumping or spreading in layers from 1 to 36½ in. in depth; 21-in. external hydraulic brakes, lined with 300 sq. in. of woven braking surface for positive stopping; special analysis steel and box-beam construction for strength with light weight; and cable operation from a double-drum power control unit.



WHAT'S the Answer?

Straightening Bent Spikes

Should bent track spikes be straightened by the section forces, or should they be sent to the stores department or reclamation plant to be straightened? Why?

Sections Do Not Have Time

By Armstrong Chinn
Chief Engineer, Alton, Chicago

Straightening bent track spikes is a job for a man equipped with the proper tools and safety devices and who is especially trained for the work. For this reason they should not be straightened by the section men, but should be sent to the stores department or the reclamation plant, where one or more men, as needed, can be trained and equipped for the job.

Spikes can be straightened best with a hand hammer and a small anvil, and a trained man can straighten a spike with a few blows. His place of work can be arranged so that there is a bin to hold the bent spikes on one side and a bin or a number of empty spike kegs on the other to receive the straightened spikes. With this arrangement there will be no lost motion and the work will be done efficiently. Furthermore, it is not difficult or expensive to equip one or more men, at a central point with the tools and safety devices that are required. The tools have been mentioned; the safety devices are goggles to protect the eyes from flying particles, a pair of heavy gloves and, if the spikes are dirty, a respirator so that dust will not be taken into the lungs.

Obviously, it would be expensive to supply every section with such equipment, and if section men attempted to straighten spikes with a spike maul or sledge, using a piece of rail as an anvil, the work would not only be done inefficiently, but would certainly result in personal injuries. In addition, section men are too busy with other work to be in position to take time out to straighten spikes. For these reasons, usable spikes should be sent to the storekeeper or to the reclamation plant, where they can be straightened economically and safely.

Only an Occasional One

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

It does not pay to have the section forces straighten track spikes, except the occasional one that is bent only slightly, and where more time would be consumed in securing a new spike than in straightening the bent one. Bent spikes of good section should be segregated and sent to the stores department or reclamation plant for salvage. Rightfully, however, spikes should not be bent; if they are, it is because they have been driven improperly or withdrawn carelessly.

When driven, spikes should be started vertically and square, with the face of the spike against the base of the rail. They should then be driven perpendicularly, and this can be done only by careful driving. Careless spikers give spikes the appearance of being driven perpendicularly by bending the spike against the rail with the last blows. Correct spiking is so important that the preboring of new ties to be installed and of ties already in the track, where rail is to be laid or regaged, can be justified economically.

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in May

1. Where traffic is diverted around a rail gang on multiple track, is it desirable to place a slow order on the new rail when traffic is resumed? Why? What should be the speed limit? How long should the restriction remain?

2. Should hot-water heating systems be emptied during the summer? Why?

3. What methods should be employed to insure that the maximum output is obtained from power machines and tools? Who should be responsible?

4. What preparatory work is necessary for jacking pipe culverts through embankments? What equipment? How many men? Does the size of the pipe or the width of the embankment make any difference?

5. Are there advantages in employing an extra gang for general maintenance on each roadmaster's district during the working season? Any disadvantages? Why?

6. Is it desirable to install duplicate pumping and power equipment at water stations? If not, why? If so, what are the advantages? The limitations?

7. Do independent fastenings in tie plates have greater or less gage-holding power than the rail spikes? Why? How much? Does the kind of fastening make any difference?

8. In view of the restrictions now being placed on civilian uses of copper, what methods can be employed to prolong the life of iron-wire screens?

Many other spikes are bent because they are withdrawn carelessly. Spike-pulling machines that draw them straight up are justified where rail is being renewed, but for ordinary work where only a few spikes are to be pulled, claw bars with correctly designed heels should be employed. Claw bars with movable jaws that can grip the shaft of the spike and thus avoid bending it, are justified where much regaging is to be done. After all is said and done, the best procedure is to avoid bending the spike in the first place, while driving or pulling; then it will not need to be straightened.

Make Practical Approach

By C. S. Robinson
Assistant Chief Engineer, Boston & Maine, Boston, Mass.

It seems to me that the practical approach to this question is that in small track-crew operations there is no objection to the section forces straightening minor bends in spikes they have removed, but I believe that they should be educated not to attempt to do this on a wholesale scale or to correct spikes that are bent considerably. In major track operations, such as laying rail, ballasting, etc., assuming that the reclamation plant is equipped to straighten them, bent track spikes should be sent to the plant for grading and straightening.

Contrasts Old and New

By G. Stafford
Section Foreman, Canadian National, Redland, Alta.

In former years when a division released spikes the stores department gave instructions to ship the usable ones to fill requisitions. Without any intention to ship scrap but, lacking expert supervision for sorting, the order was filled with the spikes as they had been assembled. The unfortunate foreman who received the shipment had to cull them, separating the scrap and the substandard usable material. He then straightened those that were fit for his purposes, considering himself fortunate if no personal injuries occurred.

In contrast, the used spikes now go to a central clearing house or reclamation plant, where they are handled by experienced workmen. They are sorted according to condition and if serviceable they are straightened in a power press designed specially for this purpose, and which has an output many times that of hand straightening.

So far as this question relates to routine maintenance, I can see no objection to the practice of straightening a spike that is to be reused immediately. On the other hand, this practice should be limited rather strictly. No attempt should be made to straighten spikes that are so badly bent that a personal injury might result. Also, from the standpoint of economy, this should not be done when the time required is greater than the difference between the scrap value of the old one and the cost of a new one.

Water Columns in Winter

What effective method can be employed to prevent water columns from freezing during extremely low temperatures?

Make Pit Weathertight

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

The common cause of the freezing of water columns is improperly-constructed or poorly-maintained pits in which the valves are located. A water-column pit should be only as large as is required for the water-column valve and the shut-off valve on the water main, together with enough space for a workman to handle the valve when repairs are necessary. An inside size of 5 ft. by 10 ft. should be sufficient to accommodate any modern water column up to and including 12 in. The pit should preferably have concrete walls 12 in. thick and a concrete floor. A drain should be provided at one corner, connecting to a sewer, and so arranged that there is no possibility of cold air from the outside driving into the pit or it will be essentially without protection.

After filling a locomotive tank, any good column is closed off fully at the valve before the spout is pushed away from the locomotive tender, and no water should be discharging or draining from the spout as it comes to rest between tracks. An open drain under the end of the spout, as is sometimes provided, is, therefore, quite unnecessary. Such a drain connected with a water-column pit may permit enough cold air to enter to cause freezing of the pipe or valve.

The cover of the pit, which partly supports the column base, should preferably be of 3-in. lumber resting on 6-in. by 8-in. cross timbers. If the timber frame is inserted within the concrete side walls, earth filling can be brought to the top of the concrete for full insulation, without decaying the timber. Between the timber and the 3-in. floor covering, a layer of tarred felt and 1-in. by 6-in. D-and-M flooring will act as an insulator. Also, on the underside of the timbers, a double layer of 1-in. by 6-in. D-and-M flooring, with a double layer of tarred felt between, helps to make an air-tight cover and at the same time provides dead air spaces between the timbers. For extremely cold climates it is well to provide a frost deck in the pit about 18 in. below the cover, consisting of a double layer of 1-in. by 6-in. D-and-M flooring, with two layers of tarred felt between.

With a pit constructed in this manner and with the manhole openings through the cover and the frost deck kept in good repair, with tight doors, there is usually not much danger of freezing, unless the pit is located on the side of an embankment. In such a case there must be an ample bulge in the embankment to provide solid-earth frost protection.

In extreme cases, if water is taken only at long intervals a large barn lantern or small oil stove is used to keep out the frost, but in the majority of cases this will be unnecessary if the pit details are properly maintained. It helps to improve winter operation if the exposed moving parts of a water column are coated with heavy grease before cold weather starts, because this prevents to some extent the accumulation of frost or ice on these parts.

No Excuse for Freezing

By Supervisor of Water Service

I can see no excuse for allowing a water column to freeze, even under long-continued low temperature. I can remember when the freezing of water columns was not uncommon, but with improvements in design and construction—and I want to emphasize that both are important—of the water-column pits, this trouble has been all but eliminated. We do have one freeze occasionally, but always find that some person was to blame for the occurrence.

The old wooden pits, of which I have seen quite a few, were difficult to maintain, for the untreated wood of

which they were constructed decayed quickly, and they were never weathertight. The brick pits were an improvement, but apparently few water-service men took a throught about insulating them. The cover was made to fit over the outside face of the wall, so that the top was hidden. The top courses of brick were generally loose, but this attracted little attention until they were ready to fall out. Little could be expected in the way of thermal protection from pits of either of these types, and little was obtained.

Today, all of our water column pits are of concrete. The top is rebated so that the cover, which is of wood, sets inside the wall, the space between the cover and the pit wall being calked. This cover is made weather tight. About 20 in. below this, resting on a shelf that is cast in the concrete, is a second cover, well insulated. A few of our pits, where electric power is available, are wired so that under extreme conditions an electric light can be turned on to provide a small amount of heat in the pit.

Disposing of Failed Rails

What disposition should be made of failed rails and those removed from the track because of observed defects? Does the weight of the rail or the character of the defect make any difference?

Many Can Be Used Safely

By L. L. Adams
Engineer Maintenance of Way, Louisville & Nashville, Louisville, Ky.

No rail or any usable part of a rail should be classified as scrap so long as it can be used safely in some track. A rail that must be removed from a main track because of some failure or potential failure may often be used safely in a siding or a yard track, while another rail, by reason of the cause of failure, should be relegated to scrap to avoid any chance of its being returned to main-track service. The causes of failure may be divided into three general classes, namely, internal defects, external damage and general wear.

Rails that fail from internal defects, such as transverse or compound fissures, should be disposed of as scrap. The presence of one shatter crack in a rail, from which these fissures develop, indicates that there are others in the same rail and no chances should be taken that any part of such a rail might be returned to main-track service. Where a fissure develops under a driver burn or from any other external cause, any part of the rail that is of sufficient length should be classified as relay rail and held for future use. If a rail has failed from a split head and has been removed from the main track before the defect has developed to such an extent as to make the rail dangerous, it can be reused in a yard track without any danger. Regardless of the type of failure that may develop from an external cause, any usable part of the rail should be classed as relay rail. Where a rail fails from general wear, it has served its life and should be classified as scrap.

The weight of the section should have no effect on the manner of its disposition. If it is a light section, however, that is obsolete or is no longer being reused on the road, it should be classified as scrap regardless of the cause of failure.

Damage versus Defect

By C. W. Baldridge
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

Rails that have failed by reason of breaks, in which no flaws or defective material can be detected, are usually suitable for reuse as short rails, but they should be cut off to square ends before they are relaid. If not too badly worn, they might well be used for repairing frogs, guard rails or crossings. Rails that have broken in service by reason of transverse or compound fissures, bad vertical or horizontal split heads or head-check failures, should be consigned to the scrap pile, making certain that they do not escape this fate.

Rails that fail from fillet cracks, small horizontal splits and similar defects should also be barred from further use in running tracks. However, if these flaws have not developed too far, the rails can be reused with reasonable safety in sections of spur tracks over which locomotives do not pass.

Failures of rails which have been butt-welded for use in crossings, or continuously in main track are weld failures and not rail failures, if the failure is at or near the weld. For this reason, such rails may be cut back beyond the portion affected by the heat of the weld and the rail may be reused in any place it is needed.

Rails in which bolt-hole breaks and deep chipped-end failures occur should be suitable for reuse after being cut back, provided careful inspection does not disclose defects. After the cuts are made, the new ends so created should be examined carefully for defects. As a rule, such rails should not be cut until a short rail is needed, at which time the rail can be cut to the needed length.

Rails that have been bent or kinked, but which are not chipped or do not show evidence of cracks, can be straightened and used again in the same class of track from which they were removed. If possible, this should be done in a gaging press by skilled men. Rails that have been nicked in the base by broken wheels or by anti-creepers that have been struck by derailed wheels, dragging equipment or spike-maul blows, should be removed from the track. Such rails can usually be used with safety in unimportant sidings. If the nicks are in the head they create practically no danger and the rail can remain in service, unless they are deep and angular. On the other hand, if the blow has bent the rail to such an extent that good surface cannot be maintained, it will be better to remove it and reuse it in some siding or less important track. However, the straightening of nicked rails is a somewhat dubious practice.

In general, the weight of the rail makes little difference, because the loads increase as rapidly as the weight of the rail to be used. The character of the defect does make a difference, as already indicated, transverse fissures particularly, for they rarely give any warning. If, therefore, any indication of such a defect is found in a rail, it should be removed from the track at once and under no condition should it be used in the track or in T-rail bridge spans. Usually, but not always, compound fissures do show advance indications of failure. Head-check failures always give advance notice, but in many instances the checks develop very rapidly. For this reason they should be kept under close observation and the rails should be removed as soon as necessary.

Most failures resulting from defects or poor steel, develop slowly enough so that the impending failure

can be foreseen and the rail removed in ample time before actual failure occurs. Plain or stress breaks cannot be foreseen, for one does not know when the overstress will occur. The correct attitude toward defective rails or those of doubtful quality, is to remove them from the main track and get them into less important tracks where traffic is light and movements are slow, and thus obtain longer service from them.

Cribbing for Headwalls

Is concrete cribbing suitable for headwalls for pipe culverts? If not, why? If so, what are the advantages?

May Be Installed Readily

By M. Hirschthal
Concrete Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

Headwalls for pipe culverts may be installed readily by means of precast concrete cribbing as satisfactorily as by concrete cast in place. There have been numerous installations of this character, and they have demonstrated the same advantages as those attaching to the use of precast members in other reinforced-concrete construction. These include the omission of form work and the concrete-mixing plant, or the use of ready-mixed concrete, as well as the other equipment and the labor incident to cast-in-place concrete. There is no curing on the job, for the precast units have already been cured, and consequently no waiting period for the placing of the fill. In addition, the danger of the formation of cracks in the headwall, as a result of settlement, is eliminated.

Among the disadvantages are the necessity of cutting the cribbing units to fit the curvature of the pipe, particularly if the closed-face type is selected, and the use of extra members (headers) between the pipe and the end of the section. Both of these items result in an added expense for installation, thus reducing the savings that are made in the other items that have been mentioned, compared with the cost of cast-in-place concrete, where the forms on the job can be used only twice. In winter, there is obviously an additional advantage in not having to heat the aggregates and water and of eliminating the protection of new concrete during the curing period to prevent damage from frost.

Depends on Situation

By Supervisor of Bridges and Buildings

Like almost all other materials used for structures, cribbing units, whether of concrete or of corrosion-resistant metal, are almost perfectly adapted for use as headwalls for pipe culverts in some situations, and are as completely unsuited in others. Where the ground is stable and there are no indications of wash, cribbing will be as satisfactory for headwalls as the more expensive concrete that is cast in place. Furthermore, any movement in the culvert itself as a result of frost action will not affect the headwall, because it is independent of and not attached to the pipe.

If the soil is easily eroded or the current has a high velocity at flood stages, and particularly if the stream enters the culvert at an angle, the cribbing may not be satisfactory, although I have seen it used successfully under rather adverse circumstances in these respects. If the ground is soft and boggy, so that a satisfactory foundation cannot be obtained, headwalls may not be necessary, although I prefer that every culvert have a headwall. Under these circumstances it is my experience that a crib headwall made of preframed creosoted timber is more satisfactory than one of concrete or metal units.

Cribbing has several advantages over the mass concrete types of headwall, some of which are inherent in all precast, preformed or preframed units. It is cheaper to install than the mass concrete and it requires practically no maintenance during its service life, provided it was properly assembled at the time of installation. There are no forms to build, no material other than the cribbing itself to assemble and relatively little labor is involved in its erection. If the roadbed is to be widened or the grade raised, all that is necessary is to add enough units, vertically and horizontally, to retain the added material. In comparison, it might be necessary to tear down a concrete headwall and replace it; or, at least, it might be necessary to buttress it before it would be safe to add to its height. Again, a crib headwall can be lengthened at relatively low cost, if this becomes necessary, by merely adding more units. Another item not to be overlooked in this day when so many miles of lines are being abandoned, if the culvert is abandoned during the service life of the cribbing, the headwall can be salvaged completely.

Getting Ready to Paint

How should a new wood surface be prepared for painting? An old surface that has been painted? What details are important? What precautions should be observed?

Must Be Dry

By W. C. Harmon
Supervisor Bridges and Buildings, Southern Pacific, San Francisco, Cal.

It is essential that a surface to be painted be dry and it is highly desirable that it be seasoned throughly. Paint will not adhere to moist surfaces and oil will not penetrate the wood satisfactorily. The eventual results of painting damp wood are flat spots and water blisters. If there is moisture in the wood it seeks to escape and frequently does so by seeping out under the paint at points where it failed to adhere to the wood.

The surface should be examined for pitch pockets, for knots that exude sap and for stains. These defects should be given special attention, either to eliminate them or seal them, so that they will not affect the paint. Shellac is excellent for this purpose, but aluminum paint serves better in some cases. All cracks, dents, nail holes and other similar defects or damage should be puttied after the priming coat has dried. All rough spots should be sandpapered and, in general, the surface should be uniform and smooth.

Old painted surfaces frequently present problems that are difficult to solve inexpensively if a first-class job of painting is desired. There is a limit to the life of paint and to prepare a surface for repainting after this limit has been reached means, in many cases, the removal of the old coat by burning, by scraping or with liquid paint remover. Torch burning may be hazardous and should be employed only in places where the flame cannot enter cracks and start fires on the in-

terior of the walls. In most cases the old surface will need only to be washed or brushed thoroughly, after which holes should be puttied and rough spots sandpapered. If it has been necessary to remove any of the old paint, these areas will require special attention. The edges of the areas should be scraped, the edges of the old paint should be sandpapered to a feather edge and the exposed surface should be pre-coated with lead in oil to even up the surface, before the general priming coat is applied. To give the old paint the desired tooth, the whole surface should be sandpapered and dusted with a brush. Time spent in preparing surfaces to receive paint always pays large dividends.

Close Inspection Pays

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

First and most important, the surface should be dry, with no excess moisture below the surface. If water has access to the back of any surface to be painted, this situation should be corrected before proceeding with any other preparations, as moisture in the timber will invariably cause early failure of the paint. Close inspection in advance of painting to insure that all joints are water tight, and all surfaces smooth is also of great importance.

If the surface has been painted previously, all of the old paint should be removed, for much of the fading of paint can be traced to the condition of the old paint that was not removed. It is good practice, when cleaning an old surface for repainting, to burn and scrape the old paint from the entire area. This can be done economically and safely by using propane gas with low-pressure burners. The flame softens the paint, making it easy to remove, but does not char the wood; at the same time there is enough heat to dry the outer surface thoroughly so that the cleaning can be followed immediately by the priming coat. Each coat of paint should be thoroughly dry before the succeeding coat is applied. The application of the second and third coats is often carried out before the first or second coat is dry, and failure of the paint is hastened by doing so, and much of the effort to prepare the surface is nullified.

Plank for Highway Crossings

What thickness of plank is most satisfactory for highway crossings? Why? Does the weight of the rail make any difference?

Keep Variations Down

By E. L. Banion
Roadmaster, Atchison, Topeka & Santa Fe, Marceline, Mo.

To reduce the number of sizes of timber ordinarily used in highway crossings at grade, and thus reduce the stock that must be carried, it is desirable to adopt a thickness of plank that will accommodate the greatest number of rail sections, and yet will be of sufficient thickness to stand up under vehicular traffic. Experience has shown that hardwood plank, 4 in. thick, will be suitable for all weights of rail from 75 to 131 lb., provided furring strips of the same wood are used on each tie to obtain the desired height.

For instance, furring strips 1½ in. thick are used with 90-lb. rail, while strips 3⅛ in. thick are required with 131-lb. section. These center furring strips are slotted on the ends against the rails to allow for spikes and tie plates and are 4 ft. 3½ in. long. The outside strips are 8 in. by 18 in., both being of the thickness specified for a particular weight of rail.

While it is desirable to keep the number of sizes as low as possible, so far as the beveled ends, width or other milling is concerned, it is concluded that no field cutting of the plank should be permitted. For this reason, some of the planks should be in 8-in. widths, some in 10-in. widths; some should be beveled on both ends, some on one end only and some should not be beveled at either end, all of these requirements depending on the length of the crossing. In this way every crossing, regardless of its length, can be put together by the right combination of presized plank, and thus all field cutting of the treated timber is eliminated.

Since there is always a certain amount of hazard that dragging equipment will tear out and run over the plank, it is believed that this hazard increases as the thickness of the plank increases. The planks must be fastened securely to the ties and must not project over the sides of the ties. Lag screws are recommended for holding down crossing plank, particularly where the track is laid with the heavier sections.

Good crossings are essential in the interest of safety and economy, not only to vehicular traffic but to safe operation of high-speed trains. Experience leads to the belief that creosoted black gum plank will give maximum service life and will be most satisfactory for crossings. The maintenance of way forces should be equipped with the tools necessary to install and maintain grade crossings in as near perfect condition at all times as is possible. Makeshift materials should not be used, since they are extremely difficult to keep in place, even under favorable conditions.

Don't Get Them Too Thick

By L. A. Rape
Section Foreman, Baltimore & Ohio, Crothers, Pa.

My experience indicates that crossing planks having a thickness of 4 in. are most satisfactory for all weights of rail except, obviously, those lighter sections which require less thickness. Planks of this thickness will sustain any load that is likely to be allowed on the highway and they can be adapted for use with any weight of rail above, say, 75 lb. by the use of furring strips of varying thickness. Planks of this thickness do not warp readily and can be held in place without the use of special fastenings, although wood screws make the preferable fastening. In this connection, it should be recognized that good quality untreated crossing planks rarely wear out; they fail by reason of decay or splitting. For this reason, only treated plank should be used. For the same reason, it is a waste of money and material to use plank having a greater thickness than 4 in. when this is sufficient.

4 In. Most Satisfactory

By J. M. Bischoff
Office Engineer, Terminal Railroad Association, St. Louis, Mo.

Plank 4 in. thick is most satisfactory for use in highway crossings, because it is heavy enough to sustain vehicular traffic, thick enough to prevent warping and thin enough to permit the insertion of furring strips on the crossties, to provide an air space between the plank and the ballast. The foregoing comments apply to rail having a height of approximately 6 in. As the heights of rail in use range from 5 to 6½ in., the weight of the

rail does not warrant a variation from the 4-in. thickness of the planks. The only difference which the weight of the rail does occasion is in the thickness of the furring strips.

Same as the Rail

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

More satisfactory service will be obtained from wood plank applied to grade crossings on important heavy-traffic highways when the thickness of the plank is the same as the height of the rail, and the plank is fastened firmly to smooth-surfaced ties. This thickness affords greater resistance to the heavy loads passing over the crossing and also increases the stiffening of this part of the track section. However, the plank should be of hardwood to resist surface wear, and treated to prevent decay of the timber.

The plank should also be preframed for bolting in two sections between the rails and in a single section outside the track. The plank next to the rail should be framed to fit over the flange and tie plates and should be placed tightly between the flangeways. Each plank should be fastened to alternate ties, with double fastenings at each end. The fastenings should be ¾-in. by 10 or 12-in. lag screws, the heads of which should be countersunk and sealed with hot asphalt, to prevent the entrance of water. Where the track is drained adequately and is well surfaced, this type of crossing is quite satisfactory if well maintained.

Asphalt for Heavy Duty Floors

Is asphalt suitable for floors subject to trucking or the handling of heavy materials? If not, why? If so, what are the advantages? How can the floors be repaired?

There Are Two Types

By Frank R. Judd
Engineer of Buildings, Illinois Central, Chicago

There are two types of asphalt floors, namely, sheet mastic and manufactured asphalt blocks. Either type, if manufactured and installed under proper specifications, is suitable for trucking or the handling of heavy materials. In this connection, it should be borne in mind that no wearing surface, however good it may be inherently, is any better than its foundation. For this reason, if best results are to be obtained, both sheet mastic and asphalt blocks should be installed over a concrete base adequately reinforced. Asphalt floors of both types should be kept free from oil, steam and hot water, as they tend to soften and disintegrate the finished wearing surface. Both types of asphalt floors can be repaired readily, particularly if a good foundation has been provided and the repair work is confined to the wearing surface only. Under high humidity at the time of rapid weather changes, difficulty may be experienced with asphalt floors in unheated buildings, as a result of condensation. This feature of these floors should be given consideration when deciding upon the type of wearing surface to be installed in an unheated building that will house commodities likely to be susceptible to damage by the collection of moisture on the floor.

Good judgment should be exercised in the selection of the type of asphalt floor to be employed in the structure, with particular emphasis on the weight and density of the traffic carried. Where floors are subject to extremely heavy and concentrated loads, asphalt blocks, if they have been manufactured properly, will give much better results than sheet mastic, because high-grade blocks are made in presses under enormous pressure.

Asphalt Is Suitable

By General Inspector of Buildings

Under many conditions asphalt is equally suitable with other materials for floors, for the wearing surfaces of platforms and for similar purposes. If of the right quality, it can be used for floors of freight houses and warehouses, which are subject to heavy loading, heavy trucking and the handling of heavy materials. Asphalt in any form is not suitable for floors subject to oil drippings or that are exposed to steam or hot water. The oil disintegrates the asphalt so that the surface will fail eventually, while the heat from the steam or hot water softens it so that it will flow under the pressure of static loads or the rolling action of trucking, and will soon be too rough for use.

When considering asphalt for floors, it should not be overlooked that asphalt is a plastic material which of iself has no structural strength and offers little resistance to flow under load. For these reasons, it must be supported by a rigid base capable of carrying the loads and must be treated in such a way as to stiffen it and develop resistance to flow. The latter is accomplished by mixing the asphalt with mineral aggregates that are graded carefully with respect to size.

As applied to freight-house floors, asphalt comes in two forms. The first is heated and mixed with aggregate and then is spread and rolled or tamped into place to form a continuous sheet 1½ to 2 in. thick over the base. The other form is that of blocks that can be laid in place much after the manner of paving brick. These blocks should be laid tight. To assure that this is done, it is customary to lay them as closely as possible and then, after several courses have been laid, they are driven to a tight fit.

When placed, sheet asphalt is hot and plastic enough to be poured from the container, so that it flows into any irregularities there may be in the base, making it unnecessary to make provision for leveling the surface of the base. On the other hand, asphalt blocks are laid cold, and any considerable irregularity in the base will soon be reflected in the wearing surface of the floor. For this reason, unless care has been exercised to smooth the surface of the base, a sufficient amount of dry sand should be used to level or smooth out any depressions that may be present in the base. This is not intended as a sand cushion, as in the case of paving or of brick platforms, but merely as a means to provide a smooth surface for the support of the asphalt blocks.

In general, only a limited amount of pressure from tamping or from a hand roller can be applied to sheet asphalt as it is laid. Asphalt blocks are made under high pressure so that their density is much greater than that of the sheet asphalt. That this is a feature of some importance has been demonstrated by the fact that block asphalt floors apparently have a longer service life than sheet-asphalt floors subject to the same usage.

Asphalt is impervious to water, for which reason a correctly-laid sheet asphalt floor is completely waterproof. When an asphalt-block floor is laid, no matter how tightly the blocks have been driven together, water can seep through the joints. With the passage of traffic, however, the abutting surfaces of the blocks seem to weld and the floor then becomes impervious to water.

Another important item in connection with asphalt floors is that

asphalt lasts longer if subject to kneading than when it remains undisturbed. For this reason, the material remains plastic and lively under trucking while under no load or under static loads it tends to dry out, harden and crack. If, therefore, only a small percentage of the floor area will be subjected to trucking and the remainder is given over to piled or other stationary loads, it may be that some other material will give better service.

No other type of floor is simpler to maintain. Any spots in a sheet-asphalt floor that need renewal can be cut out. It is then necessary to heat only a small amount of the material and roll or tamp it into place. Asphalt blocks can be removed with relative ease and replaced without difficulty.

Shimming Heaving Track

What precautions should be given particular attention when shimming heaving track? When removing shims? Why?

Select Shims Carefully

By P. O. Ferris
Chief Engineer, Delaware & Hudson, Albany, N. Y.

Selection of the shims as to kind of wood, variety of sizes and exactness of manufacture, is the first consideration. Because of higher speeds, it is essential that the utmost care be exercised to assure smoothness of runoff from the heaved portions of the track and thus avoid numerous slow orders.

With the higher rails now in use, if thick shims are required, the rails must be braced carefully, especially the high rails on curves. If the thickness of the shims is such that braces are not considered necessary, double spiking should be considered. Special long shimming spikes should be used as required. There should be no question of doubt that the rail is secure against spreading or overturning.

Since the roadbed freezes gradually and thaws gradually, frequent inspection of the shimmed portions of the track should be made to insure not only that the original installation is being maintained properly, but, as well, to discover whether any changes in the thickness of the shims are necessary. It may be necessary to change shims frequently when the frost is leaving the roadbed in the spring. If this is not watched carefully, the heaved track will settle low, leaving the shimmed track high and the conditions of surface will be reversed until the shims are removed.

Although shimming is a temporary remedy for a track condition that occurs only during the freezing months of the year, considerable permanent injury to the ties is caused by the insertion of the shims. Careless workmen can cause shimming to be very expensive, especially where treated ties are used. Instructions should be definite with respect to spiking, in that spikes should be redriven in the same holes from which they have been withdrawn wherever it is possible to do so. The use of the adze should be avoided except in unusual circumstances. A treated tie with untreated wood exposed, especially in the vicinity of the rail base, may lose three-fourths of its service life.

Places where excessive shimming becomes necessary should be marked carefully and reported. Many of these places can be cured by improving drainage or by replacing worn-out or foul ballast. Tests of rock-salt impregnation of the roadbed at some very bad points on the D. & H. give considerable promise of relieving conditions where track heaves.

Graduate Thickness

By O. H. Carpenter
General Roadmaster, Union Pacific, Pocatello, Idaho

Protection of traffic is the first and most immediate precaution where heaving is severe and heavy shims become necessary. The action to be taken will depend, however, on the length of track to be shimmed and the thickness of the shims that are being used. Where shims thicker than 1 in. are being used, flagmen should be sent out in both directions before starting the work and trains should be held until the spot can be shimmed.

Aside from the protection of trains, the most important thing to guard against is widening gage. All spike holes should be fully plugged before the spikes are redriven. When the shims are from ¼ to ¾ in. thick, the ties should be double spiked on tangents, and the high rail on curves should be double spiked on all shimmed track. Where shims are more than ½ in. thick, spikes longer than the standard should be used, and some method of bracing the spikes or the rail should be employed. Some roads use wood or steel braces to hold the rails to gage, and spikes can be braced in some cases where lighter shimming is being done by placing a tie plate against the outside spikes and spiking it to the tie.

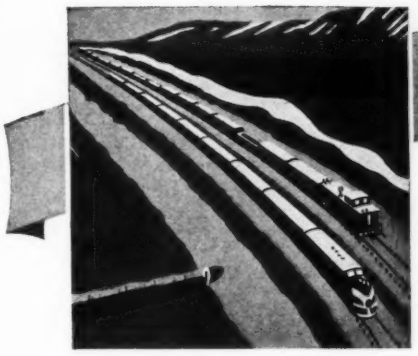
When shimming, the ties should be cleaned of all ice and snow and the tops should be smoothed with an adze, if necessary, to provide good bearing for the shims. Full-sized shims, bored for the spike holes, to fit the rail and tie plates in service, should be used. The shims should be of the right thickness to correct the heaving so it will not be necessary to place two or more shims on top of each other. The shims should always be placed between the tie plate and the tie—never between the tie plate and the rail. No snow or ice should ever be allowed between the shim and the tie or between the shim and the tie plate, for this will tend to cause slipping of the shim or of the plate and result in wide gage.

Men shimming track should be careful to graduate the thickness of the shims, this graduation to be in increments of ⅛ in., so that no strain will be put in the rail by reason of unequal support. The gage and level should be used at all times while shimming. Line should be watched as carefully as gage level and surface, for track often heaves out of line as well as gage and surface.

Where possible to avoid it, shims should not be placed on sharp curves, especially under the outer rail, and where this becomes necessary a slow order should be placed. Where the track can be protected by a reasonable slow order without shimming, the order should be placed, because it is generally necessary to leave the order on anyway after the shims have been placed. Furthermore, all places where heavy shimming has been done should be protected by appropriate slow orders.

When shims 2 in. or more in thickness are required, long shims extending under the rail and reaching to the center of the track should be employed, provided only one rail is to be shimmed. If both rails need shimming, the shim should extend under both rails and be spiked to the tie with boat spikes. Thinner shims can then be used on top of these long shims where necessary to provide an even bearing and for leveling the rails.

When removing the shims, the same precautions should be observed as when inserting them, except that it is frequently necessary to take out thick shims and replace them with thinner ones as the frost leaves the ground and the track settles gradually.



NEWS of the Month

Warns of Local Transport Shortages

As a result of increased employment, construction of new industrial plants in outlying areas, stoppage of private automobile production, restriction of civilian purchases of tires, and other factors, local transportation services will be called upon this year to carry the heaviest loads in history, and many cities face acute transportation shortages, Joseph B. Eastman, director of defense transportation, declared in a statement February 17.

Union Pacific Defense Bond Drive

As the result of a drive to encourage Union Pacific employees to buy defense bonds, 31,709, or 86.5 per cent of the company's employees, have either subscribed to monthly payroll deductions or are purchasing bonds with cash, and indications are that deduction and cash purchases for the year will far exceed $7,000,000. The drive to encourage the purchase of bonds was begun on January 1. When it was closed on January 31, the monthly deduction purchases totaled nearly $303,000, and cash purchases close to $2,290,000.

80,502 Freight Cars, 633 Locomotives Installed in 1941

Class I railroads put 80,502 new freight cars in service in 1941, the largest number installed in any year since 1929, according to the Association of American Railroads. This was an increase of 14,957 compared with the number of new freight cars put in service in 1940; in 1929, the railroads installed 84,894 new freight cars. New locomotives installed in service in 1941 by the Class I roads totaled 633, of which 161 were steam and 472 were electric and Diesel-electric. This was the largest number put in operation since 1930. In 1940, there were 419 new locomotives put in service.

WPB Allots Steel for Maintenance

The War Production Board has approved a railway maintenance program for the first quarter of 1942, calling for 900,530 tons of steel, of which 538,000 tons is for new rail. Press reports indicate, however, that within the last few days the allocation for rail has been reduced to 219,000 tons. J. B. Eastman, director of defense transportation, has presented to the WPB his estimates of the requirements of the railways for materials and equipment during the remaining nine months, and the assumption is that these quantities will be allotted accordingly.

Director Eastman stated recently that "the greatest problem which all transportation faces is with respect to an adequate supply of materials and equipment for adequate maintenance and replacements first, and then for the minimum necessary expansion program. There is distinct danger that the supply of available materials and the plants that manufacture transportation equipment will be diverted or converted to war production purposes to an extent that will threaten the efficient functioning of transportation. That must not be allowed to occur, because it will set back the whole war effort. Transportation is so woven into our whole industrial mechanism that it is indispensable at every turn to its performance."

Eastman Suggests More Rail-Truck Co-ordination

Declaring that the railroads and trucks are complementary transportation agencies, Joseph B. Eastman, director, Office of Defense Transportation, told the New England Shippers Advisory Board in Boston, Mass., on February 12 that one good result of the rubber shortage will be to give a practical demonstration to the railroads of the importance of motor vehicles to them. The defense chief also reiterated the warning he has enunciated in previous speeches that transportation is the very foundation of the industrial mechanism of the country and must be accorded more materials and equipment by priority authorities if it is to continue to handle the demands of an increasing traffic.

Expanding on his point that the railroads and the trucks are complementary, Mr. Eastman declared, "The fact is that in many large railroad systems motor vehicles are used so extensively in terminal and other auxiliary operations, and the rail operations are so geared to these uses, that service would suffer disastrously if the motor vehicles were lost. Another fact is that the motor carriers are handling a volume of merchandise traffic so large that, with their present equipment, the less-than-carload operations of the railroads would be swamped if they had to carry this volume. It is equally true that the passenger operations of the railroads would be swamped if they now had thrust upon them the traffic handled by buses, to say nothing of that released from the private automobile.

"Some real results can be secured in each locality by joint rail and truck co-ordination. I'd like to think that voluntary local co-operation between railroads and truckers would take place—now!"

Shipments of Oil in Tank Cars Increase

Tank-car shipment of petroleum and its products into the eastern states increased 181 per cent, and reached an all-time peak of 5,125 cars, during the week ending January 31, compared with the 1,827 cars forwarded during the week ending January 10, according to an announcement by Harold L. Ickes, petroleum co-ordinator. Loadings have mounted steadily, the statement adds, since January 10, totaling 2,410 cars for the week ending January 17, and 3.410 cars during the week ending January 24.

"The railways are doing an excellent job of moving a large volume of oil," Mr. Ickes declared in a statement which he read to the oil subcommittee of the House committee on interstate and foreign commerce, on February 17. Continuing, he said, "credit is due, not only to the oil industry but to the railways. Both are leading the way for some of our other industries in our war effort."

Pullman Meets All Army Demands

During 1941, a total of 1,957,200 United States troops were transported in Pullman sleeping cars, according to a statement issued by D. A. Crawford, president of the Pullman Company. Of this number, about 450,000, or approximately one-fourth of the total, were moved subsequent to the bombing of Pearl Harbor. As a result of the demand in 1941, the company was compelled to use one-third of its sleeping cars for military service.

In this emergency, the statement continued, the record of the American railways is the more notable when it is recalled that many times during 1941 the Nazis had to cancel all civilian railway accommodations to permit them to handle troop movements. The Pullman part of this job was a complex one, according to Mr. Crawford, because it has been necessary over and over again to reassemble on short notice hundreds of cars which had been scattered widely throughout the country in caring for previous movements, and to inspect, stock and provide these cars with trained personnel as they converged on a camp from which a new troop movement was to begin.

Association News

American Railway Engineering Association

As pointed out elsewhere in this issue, plans have been completed for the forty-third annual meeting of the association, at the Palmer House, Chicago, on March 17-19. Only one committee held a meeting during February, this being the Committee on Iron and Steel Structures, which met at the Northwestern Technological Institute, Evanston, Ill., on February 12 and 13.

Early in the month, the secretary's office sent out ballots for the election of officers and directors of the association, as well as a Nominating committee, in accordance with the nominations reported in the December issue of *Railway Engineering and Maintenance*, and subsequently sent out Bulletin No. 430, containing the last of the reports to be presented at the convention. This bulletin contains the reports of the committees on Ties, Wood Preservation, Roadway and Ballast, Track and Rail, as well as Prof. H. F. Moore's Eighth Progress Report on the Joint Investigation of Fissures in Rails. During the last week in February, members were sent the program booklet for the convention, containing the complete program of the convention, as well as a brief synopsis of the committee reports to be presented. During the first week in March, members will receive a copy of Bulletin No. 431, the Year Book bulletin of the association, containing the constitution, list of members, and reports of the secretary and treasurer.

Maintenance of Way Club of Chicago

The meeting of the club, which was held in the Ambassador room of Huyler's restaurant, Chicago, on February 16, with 136 members and guests in attendance, was given over to a discussion of maintenance of way materials. The guest speaker of the evening was A. C. Mann, vice-president in charge of purchases and stores of the Illinois Central, who, discussing What the Track Man Can Expect in Materials in the Months Immediately Ahead, saw many restrictions in prospect, and pointed out that maintenance men must face this situation.

The next meeting of the club, which will be held on March 23, will be addressed by J. B. Martin, general inspector of track, New York Central, on Conservation of Materials to Secure Maximum Service Life.

Wood-Preservers' Association

Approximately 325 railway and other men interested in the treatment and use of wood gathered for the thirty-eighth annual meeting at Minneapolis, Minn., on January 27-29. The meeting was presided over by W. R. Goodwin, engineer, wood preservation, M. St. P. & S. S. M., Minneapolis. W. P. Conyers, Jr., vice-president and treasurer of the Taylor-Colquitt Company, Spartanburg, S. C., was elected president to succeed Mr. Goodwin. H. L. Dawson, Washington, D. C., was re-elected secretary-treasurer. It was voted to hold the next annual convention at Cincinnati, Ohio, on April 27-29, 1943.

In addition to passing upon reports of committees dealing primarily with the perfection of preservatives and preservative practices and with the service records of treated timber, addresses were presented on The Service Secured from Gum Ties on the Missouri Pacific, by W. J. Burton, assistant to chief engineer, M. P.; on The Service Secured from Crossties on the Northern Pacific, by B. Blum, chief engineer, N. P.; and on The Outlook for Preservatives, by George M. Hunt, chief, Division of Wood Preservation, Forest Products laboratory, Madison, Wis.

Railway Tie Association

At a meeting of the Executive Committee at Minneapolis, Minn., on January 26, arrangements were made to hold the twenty-fourth annual convention of the association at the Netherland Plaza Hotel, Cincinnati, Ohio, on May 6-7.

Roadmasters Association

President A. B. Hillman is planning a meeting of the Executive Committee in Chicago on April 13. The proceedings of the last annual convention are now in type and it is expected that they will be mailed to the members late in March.

Bridge and Building Association

Proceedings of the last annual convention are going into the printshop and it is expected that they will be ready for distribution to the members in April. President R. E. Dove is planning a meeting of the Executive committee in Chicago on April 20.

Committees have been appointed to investigate and report on subjects selected at the last annual convention, as follows:

No. 1—Wearing Surfaces for Building Floors, Platforms and Roadways—T. H. Strate (chairman), div. engr., C.M.St.P. & P., Chicago; W. F. Hutcheson (vice-chairman), asst. supv'r b. & b., C. & O., Newport News, Va.; L. E. Peyser (vice-chairman), asst. arch., S.P., San Francisco, Cal.; R. C. Baker, supv'r. b. & b., C. & E. I., Danville, Ill.; Maxfield Bear, est., C. & N. W., Chicago; G. W. Bensen, supv'r. b. & b., C. of Ga., Macon, Ga.; Armstrong Chinn, ch. engr., C. & A., Chicago; H. M. Church, supv'r. b. & b., C. & O., Richmond, Va.; G. V. Coffey, asst. supv'r. b. & b., M. C., Jackson, Mich.; C. Djuvik, asst. supv'r. b. & b., T. C., Nashville, Tenn.; R. G. Hilton, asst. engr., M. P., Houston, Tex.; N. D. Howard, managing editor, *Railway Engineering and Maintenance*, Chicago; J. A. Jorlett, asst. mast. carp., Penna., Jersey Shore, N. J.; T. C. Saunders, engr. asst., T. & N. O., North Bay, Ont.; and C. U. Smith, gen'l. mgr. & ch. engr., Board Harbor Commission, Milwaukee, Wis.

No. 2—Rail Fastenings on Bridges, Pits and Turntables—J. S. Hancock (chairman), bridge engr., D.T. & I., Dearborn, Mich.; G. S. Crites (vice-chairman), div. engr., B. & O., Punxsutawney, Pa.; H. B. Christenson, div. engr., C.M.St.P. & P., Savanna, Ill.; J. J. Clutz, div. engr., Penna., Indianapolis, Ind.; H. M. Harlow, asst. supv'r. b. & b., C. & O., Clifton Forge, Va.; H. W. Hauerslav, ch. dftsman, C.M.St.P. & P., Chicago; J. E. Hogan, asst. div. engr., C. & O., Hinton, W. Va.; R. W. Johnson, asst. engr., C.M.St.P. & P., Chicago; W. J. Lacy, supv'r. b. & b., M. P., Jefferson City, Mo.; H. C. Madson, designer, C. & N.W., Chicago; F. H. Masters, ch. engr., E.J. & E., Joliet, Ill.; A. A. Sirec, engr. dftsman, C. & N. W., Chicago; E. E. R. Tratman, civil engr., Wheaton, Ill.; and B. M. Whitehouse, gen'l. bridge insp., C. & N. W., Chicago.

No. 3—Meeting the Demands for Increased Water Supplies in Fast Freight Service—J. P. Hanley (chairman), water ser. insp., I. C., Chicago; R. E. Caudle (vice-chairman), asst. engr. struct., M. P., Houston, Tex.; A. E. Bechtelheimer, engr. of bridges, C. & N.W., Chicago; W. D. Bird, gen'l. foreman b. & b., A.T. & S.F., Albuquerque, N.M.; L. A. Cowsert, water insp., B. & O., Dayton, Ohio; H. C. Crawford, gen'l. foreman b. & b., S.P., Dunsmuir, Cal.; V. E. Engman, ch. carp., C.M.St.P. & P., Savanna, Ill.; W. A. Hutcheson, supv'r. b. & b., C. & O., Clifton Forge, Va.; F. M. Lehrman, dftsman, C. & N. W., Chicago; C.A.J. Richards, mast. carp., Penna., Grand Rapids, Mich.; H. T. Right, L. V., Bethlehem, Pa.; D. C. Shaddock, foreman wat. service, N.Y.C., Corning, N.Y.; J. L. Varker, supv'r. b. & b., D. & H., Carbondale, Pa.; M. P. Walden, asst. supv'r. b. & b., L. & N., Evansville, Ind.; and K. J. Weir, special water insp., C.M.St.P. & P., Chicago.

No. 4—Preventing Accidents Among Bridge and Building Employees—E. H. Barnhart (chairman), gen'l. bridge insp., B. & O., Cincinnati, Ohio; W. A. Batey (vice-chairman) sys. bridge insp., U. P., Omaha, Neb.; L. D. Garis (vice-chairman), asst. gen'l. bridge insp., C. & N.W., Chicago; J. C. Bird, b. & b., insp., N.Y.C., Corning, N.Y.; W. W. Gaines, bridge insp., C. & O., St. Albans, W. Va.; A. G. Dorland, asst. engr., E.J. & E., Joliet, Ill.; C. C. Eubank, rodman, C. & O., Huntington, W. Va.; K. Hallock, supv'r. b. & b., C. & N.W., Fremont, Neb.; G. H. Holmes, supv'r. b. & b., M.P., Falls City, Neb.; E. H. Johnson, div. engr., C.M.St.P. & P., Miles City, Mont.; W. E. Maley, mast. carp., B. & O., Punxsutawney, Pa.; C. O. Sathre, asst. b. & b. supv'r., C. & N.W., W. Chicago, Ill.; J. W. Secker, system bldg. insp., C.M.St.P. & P., Chicago; H. E. Smith, engr. mtce., G.H. & H., Galveston, Tex.; and W. A. Sweet, gen'l. foreman, A.T. & S.F., Newton, Kan.

No. 5—The Repair of Steel Bridges—A. R. Harris (chairman), asst. engr. bridges, C. & N. W., Chicago; A. B. Chapman (vice-chairman), office engr., C.M.St.P. & P., Chicago; J. M. Salmon, Jr. (vice-chairman), asst. engr., L. & N., Middlesboro, Ky.; H. M. Buell, bridge insp., U. P., Omaha, Neb.; R. W. Cassidy, asst. cost engr., C. & O., Richmond, Va.; P. C. Chamberlain, bridge insp., Erie, Port Jervis, N. Y.; D. W. Converse, asst. engr.,

A.C. & Y., Akron, Ohio; L. M. Frost, supv'r. b. & b., G.T.W., Battle Creek, Mich.; J. E. Heck, bridge insp., C. & O., Peru, Ind.; A. M. Knowles, asst. engr. struct., Erie, Cleveland, Ohio; I. A. Moore, trainmast., C. & E.I., Salem, Ill.; R. H. Morrison, supt. b. & b., B. & A., Houlton, Me.; G. L. Sitton, ch. engr., Sou., Charlotte, N.C.; and J. J. Wishart, supv'r. b. & B., N.Y.N.H. & H., Boston, Mass.

No. 6—The Conservation of Bridge, Building and Water Service Supplies—F. G. Campbell (chairman), asst. ch. engr., E.J. & E., Joliet, Ill.; M. D. Carothers (vice-chairman), div. engr., C. & A., Bloomington, Ill.; W. L. Anderson, off. engr., C. & N.W., Chicago; M. L. Bardill, asst. engr., C.M.St.P. & P., Savanna, Ill.; W. H. Begeman, b. & b. foreman, M. P., Jefferson City, Mo.; H. F. Bird, insp. b. & b., N.Y.C., Jersey Shore, Pa.; S. T. Corey, asst. bridge engr., C.R.I. & P., Chicago; H. C. Johnson, instmn., C.M.St. P. & P., Ottumwa, Ia.; A.C. Jones, supv'r. b. & b., Sou., Parrish, Ala.; C. R. Knowles, supt. wat. service, I. C., Chicago; L. R. Pennington, supv'r. b. & b., C. & N. W., Pierre, S. D.; L. F. Pohl, asst. engr., C.M.St.P. & P., Miles City, Mont.; F. A. Scites, supv'r. b. & b. & w. s., C. & O., Huntington, W. Va.; C. W. Stephens, asst. engr. struct., D. & H., Plaza, Albany, N.Y.; and L. Summers, w. s. repairman, M.P., Bismarck, Mo.

No. 7—Piles and Pile Driving—W. F. Martens (chairman), gen'l. foreman b. & b. & w. s., A.T. & S.F., San Bernardino, Cal.; J. F. Lockwood (vice-chairman), supv'r. b. & b., C. & O., Richmond, Va.; C. F. Berg, engr. dftsman, C. & N. W., Chicago; L. G. Byrd, supv'r. b. & b., M.P., Poplar Bluff, Mo.; B. J. Chamberlain, scale supv'r., C. & E.I., Danville, Ill.; R. L. Cook, asst. engr., M. P., Houston, Tex.; M. H. Dick, eastern editor, *Railway Engineering and Maintenance*, New York; F. G. Elmquist, bridge insp., C.M.St.P. & P., Chicago; P. V. Elfstrom, dftsman, C. & N.W., Chicago; L. I. Evans, instmn., C.M.St.P. & P., Savanna, Ill.; O. M. Glander, ch. carp., C.M.St.P. & P., Mason City, Ia.; A. E. Kiles, b. & b. carp., S.P., El Paso, Tex.; J. B. Lodeski, asst. bridge insp., C. & N.W., Chicago; J. F. Montgomery, supv'r. b. & b., St.L. & S.W., Tyler, Tex.; and E. E. Tanner, gen'l. supv'r. b. & b., N.Y.C., Albany, N.Y.

No. 8—The Cleaning of Masonry Structures—W. A. Huckstep (chairman), gen'l. bldg. supv'r., M.P., St. Louis, Mo.; H. M. Harlow (vice-chairman), asst supv'r. b. & b., C. & O., Clifton Forge, Va.; F. W. Dayton, arch. dftsman, C. & N.W., Chicago; L. C. Hinsch, instmn., C.M.St.P. & P., Savanna, Ill.; C. Holland, asst. engr., C.M.St.P. & P., Minneapolis, Minn.; F. L. Koehler, div. engr., C. & O., Ashland, Ky.; S. E. Kvenberg, asst. engr., C.M.St.P. & P., Chicago; M. Meyer, supv'r. b. & b., C. & W.I., Chicago; K. L. Miner, supv'r. b. & b., N.Y.C., Albany, N.Y.; H. J. Powell, painter foreman, N.Y.C., Malone, N.Y.; F. R. Spofford, supv'r. b. & b., B. & M., Boston, Mass.; M. Stein, engr. dftsman, C. & N.W., Chicago; J. S. Vreeland, assoc. editor, *Railway Engineering and Maintenance*, Chicago; L. C. Winkelhaus, arch. engr., C. & N.W., Chicago; and H. O. Wray, engr. m. w., T.C.T., Texas City, Tex.

Personal Mention

General

P. W. Triplett, division engineer of the New York zone of the Pennsylvania and the Long Island at Jamaica, Long Island, New York, has been promoted to superintendent of the Delmarva division, with headquarters at Cape Charles, Va.

Lawrence E. Thornton, trainmaster on the Alton at Bloomington, Ill., and an engineer by training and experience, has been promoted to superintendent of the Baltimore & Ohio Chicago Terminal and the Chicago terminal of the Alton, with headquarters at Chicago.

Donald Y. Geddes, superintendent of the New York division of the Pennsylvania with headquarters at Jersey City, N. J., and an engineer by training and experience, has been promoted to assistant to the general manager of the New York zone, with headquarters at New York.

Horace E. Newcomet, vice-president of the Western region of the Pennsylvania, with headquarters at Chicago, and an engineer by training and experience, has been promoted to the position of vice-president—Chicago. Mr. Newcomet was born at Philadelphia, Pa., on April 27, 1874, and graduated from the University of Pennsylvania. He entered railway service on the Pennsylvania on February 18, 1896, as an assistant on the engineering corps of the Chicago division and from 1898 to 1901 he served successively as acting assistant engineer on the Cleveland & Pittsburgh division and assistant engineer maintenance of way on the Cincinnati division. For the following 12 years he was engineer maintenance of way successively of the Indianapolis & Vincennes, the Cincinnati, the Erie & Ashtabula and the Pittsburgh divisions. He was then promoted to superintendent of the Louisville division in January, 1913, and was transferred to the Logansport division in March, 1918, and to the Cleveland & Pittsburgh division in March, 1920. Three years later he was promoted to general superintendent of the Lake division, with headquarters at Cleveland, Ohio, then being further promoted to general manager of the Western region, with headquarters at Chicago on September 16, 1926. On June 16, 1929, he was advanced to vice-president, Western region.

Horace E. Newcomet

Arthur N. Reece, chief engineer of the Kansas City Southern and the Louisiana & Arkansas, in charge of engineering, new construction and standards, has been promoted to assistant to the president, with headquarters as before at Kansas City, Mo. Mr. Reece entered railroad service in June, 1903, as a chainman on the Atchison, Topeka & Santa Fe, after having studied civil engineering at the University of Kansas for three years, later being advanced to rodman, draftsman and instrumentman. In April, 1906, he went with the St. Louis-San Francisco as an instrumentman, later serving successively as inspector on building construction, assistant engineer and chief clerk to the general superintendent. Mr. Reece went with the Kansas City Southern in March, 1911, as an assistant engineer and in November, 1912, resigned to become chief engineer of the Hanna & Hickey Construction Co., Ft. Worth, Tex. He returned to the K. C. S. a year later as office engineer, with headquarters at Kansas City, and was later promoted to division engineer, with headquarters at Texarkana, Tex. In January, 1922, Mr. Reece was advanced to chief engineer, with headquarters at Kansas City, and in October, 1940, he was appointed chief engineer in charge of engineering, new construction and standards of the K. C. S.-L. & A. system.

Arthur N. Reece

Walter W. Patchell, general superintendent of the Eastern Pennsylvania division of the Pennsylvania, with headquarters at Harrisburg, Pa., and an engineer by training and experience, has been promoted to assistant to the operating vice-president, with headquarters at Philadelphia, Pa. Mr. Patchell was born on November 28, 1897, at Philadelphia and graduated in civil engineering from Pennsylvania State College in 1919. He entered railroad service on July 7, 1915, as tracer on the Philadelphia Terminal division of the Pennsylvania, serving as draftsman on that division during summer months while attending college. After graduation from college Mr. Patchell became assistant to the division

engineer on the Conemaugh division of the Pennsylvania on July 14, 1920, then serving successively as acting assistant supervisor on the Monongahela division, assistant supervisor on the Pittsburgh division and supervisor on the Monongahela and Panhandle divisions. On January 1, 1929, he was appointed division engineer of the Cumberland Valley (P. R. R.), and he became division engineer of the Fort Wayne division on December 16, 1929, being transferred to the Philadelphia Terminal division on July 1, 1933. He was appointed superintendent of passenger transportation of the Central region at Pittsburgh on September 16, 1933, and from November 16, 1934, to October 1, 1935, he was assigned to special duties in the office of the vice-president at Philadelphia, then being assigned to similar duties with the chief electrical engineer. On November 1, 1935, Mr. Patchell became superintendent of the Indianapolis division, being transferred to the St. Louis division at Terre Haute, Ind., on September 16, 1936, and to the Baltimore division on November 1, 1936. From January 16, 1938, to April 16, 1939, he was assigned to special duty with the chief

Walter W. Patchell

electrical engineer at Philadelphia and on the latter date he was appointed general superintendent of the Lake division at Cleveland, Ohio. He was transferred to the Eastern Pennsylvania division at Harrisburg in February, 1941.

Engineering

Howard Moore, assistant engineer on the Western division of the Southern Pacific, has retired.

H. A. Shinkle, assistant valuation engineer on the Eastern lines of the Atchison, Topeka & Santa Fe, has been promoted to valuation engineer, with headquarters as before at Topeka, Kan., succeeding **Austin B. Griggs,** who has retired.

Fred L. Thompson, vice-president in charge of the engineering department of the Illinois Central retired on March 1. His duties have been assumed by **Charles H. Mottier,** chief engineer. Mr. Thompson was born at Grand View, Ill., on February 1, 1872, and graduated from the University of Illinois in 1896. He entered railway service in June of that year as a chainman on track depression work for the Illinois Central at Chicago. He was later transferred as a rodman to Vicksburg, Miss., and to Fulton, Ky., after which he was promoted to engineer in charge of grade reduction and second track construction at Cairo, Ill. Mr.

Fred L. Thompson

Thompson was transferred to the chief engineer's office at Chicago in 1902 and in the following year was promoted to roadmaster of the Illinois division. He was later transferred to the Kentucky division where he remained until 1907, when he was promoted to assistant engineer of bridges of the Illinois Central and the Yazoo & Mississippi Valley. Mr. Thompson was promoted to assistant engineer of bridges and buildings in 1910 and in 1913 was promoted to engineer of construction. He was promoted to assistant chief engineer in 1914 and held that position until August, 1918, when he was promoted to chief engineer. On February 1, 1925, he was elected vice-president in charge of engineering, which position he held until his retirement.

Irvin LeRoy Simmons, bridge engineer of the Chicago, Rock Island & Pacific, with headquarters at Chicago, retired on March 1 after more than 43 years railroad service. Mr. Simmons was born at Hanover, Mich., on September 10, 1872, and

Irvin LeRoy Simmons

graduated in mechanical engineering from Michigan State College in 1897. He entered railway service on April 20, 1898, as a draftsman in the bridge department of the Illinois Central and on May 1, 1900, he went with the Chicago, Milwaukee, St. Paul & Pacific. In October, 1902, he left railroad service to become a draftsman for Ericson & Lehman and in March, 1903, he went with the Rock Island as an assistant engineer. In February, 1907, Mr. Simmons was promoted to bridge inspector and in September, 1909, he was advanced to bridge engineer, with headquarters at Chicago, which position he held until his retirement.

Glen H. Trout, bridge engineer of the Union Pacific, has been promoted to assistant chief engineer, a newly created position, with headquarters as before at Omaha, Neb., and **Lewis Paul Drew,** bridge inspector at Omaha, has been advanced to bridge engineer, succeeding Mr. Trout.

Eugene F. Salisbury, chief engineer—maintenance of the Kansas City Southern and the Louisiana & Arkansas, with headquarters at Shreveport, La., has been appointed chief engineer of both roads, with headquarters at Kansas City, Mo., and Shreveport, succeeding **Arthur N. Reece,** chief engineer—construction, whose promotion to assistant to the president, is reported elsewhere in these columns. Mr.

Eugene F. Salisbury

Salisbury was born at Omaha, Neb., on June 5, 1886, and graduated in engineering from Missouri University in 1908. He entered railway service in 1909 as an assistant engineer on the Missouri Pacific and in August, 1919, he went with the St. Louis Southwestern of Texas and the Louisiana & Arkansas as acting principal assistant engineer of both roads, with headquarters at Tyler, Tex. In March, 1920, Mr. Salisbury was appointed chief engineer of the Louisiana & Arkansas, with headquarters at Minden, La., later being transferred to Shreveport, and in October, 1940, he was appointed chief engineer of maintenance of way and structures of the K. C. S.-L. & A. system, which position he held until his recent appointment, effective January 28.

William Scott Broome, whose promotion to engineer maintenance of way of the Colorado & Southern and the Ft. Worth & Denver City, with headquarters at Denver, Colo., was reported in the February issue of *Railway Engineering and Maintenance*, was born at St. Jo, Tex., on August 26, 1893, and graduated from the A. & M. College of Texas in 1914. He entered railway service in June, 1914, as

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LUNDIE TIE PLATE

ASSURES MAXIMUM LIFE TO TIES

Prolongs the Life of Cross Ties
Increases the Life of Rails and Wheels
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a rodman on the Houston & Texas Central (now part of the Southern Pacific Lines in Texas and Louisiana) at Ennis, Tex., later serving as a transitman at Houston, Tex. In November, 1915, he went with the

William Scott Broome

Atchison, Topeka & Santa Fe as a draftsman in the valuation department at Amarillo, Tex., and from September, 1916, to January, 1918, he served as a field draftsman and transitman at various points in Texas, Oklahoma, New Mexico and Missouri. On the latter date, Mr. Broome went with the Forest Products Laboratory at Madison, Wis., as an assistant engineer. In December, 1918, he returned to Texas as assistant engineer on the Ft. W. & D. C. at Ft. Worth, Tex., later serving as division engineer at Childress, Tex., office engineer, with headquarters at Ft. Worth, and location and division engineer at Plainview, Tex. In November, 1928, Mr. Broome was appointed engineer of the Trinity & Brazos Valley (now the Burlington-Rock Island), with headquarters at Houston, and continued as engineer of the Burlington-Rock Island until his recent promotion.

Edward W. Prentiss, whose promotion to assistant engineer of bridges and buildings of the Western region of the Penn-

Edward W. Prentiss

sylvania, with headquarters at Chicago, was reported in the January issue of *Railway Engineering and Maintenance,* was born at Geneva, Ill., on May 30, 1900, and graduated from Armour Institute of Technology in May, 1923. He then worked about a year for Holabird & Root, architects, Chicago, four years for I. F. Stern, consulting engineer, Chicago, and a year with the United States Gypsum Company at Chicago. He entered railway service on April 1, 1929, as a draftsman on the Pennsylvania at Chicago and on June 16, 1941, he was advanced to designing engineer, which position he held until his recent promotion, effective January 1.

Joseph G. West, assistant engineer on the Atchison, Topeka & Santa Fe at Amarillo, Tex., has been promoted to acting division engineer of the Panhandle & Santa Fe, with headquarters at Slaton, Tex., succeeding **Roy C. Matthews,** whose promotion to acting trainmaster at Slaton, was reported in the January issue.

W. H. Bettis, maintenance engineer of the Norfolk & Western, whose promotion to assistant engineer in charge of construction and maintenance engineering on the Norfolk, Shenandoah and Radford divisions, with headquarters as before at Roanoke, Va., was reported in the January issue, was born at Cincinnati, Ohio, on

W. H. Bettis

June 23, 1884, and entered the service of the N. & W. in June, 1907, as a draftsman. Three years later he became a transitman, and in May, 1923, he was advanced to resident engineer. In June, 1937, he was further promoted to maintenance engineer at Roanoke, which position he continued to hold until his recent appointment, effective January 1.

C. A. Colpitts, roadmaster on the Canadian Pacific at Lloydminster, Alta., has been promoted to division engineer at Saskatoon, Sask., succeeding **D. C. Chisholm,** resigned. A biography of Mr. Colpitts was published in the September, 1941, issue, following his promotion to roadmaster.

R. Warren Grigg, assistant division engineer on the Pennsylvania at Ft. Wayne, Ind., has been promoted to division engineer of the St. Louis division, with headquarters at Terre Haute, Ind., succeeding **G. M. Hain,** who has been transferred to the New York zone and the Long Island Railroad, with headquarters at Jamaica, Long Island, N.Y., relieving **P. W. Triplett,** whose promotion to superintendent of the Delmarva division is reported elsewhere in these columns. **C. R. Uitts,** supervisor of track on the New York zone, at Jersey City, N.J., has been promoted to assistant division engineer of the Ft. Wayne division. A biography of Mr. Grigg was published in the February issue, following his promotion to assistant division engineer of the Ft. Wayne division.

Ernest B. Powell, whose promotion to assistant engineer of the Eastern Kentucky division of the Louisville & Nashville, with headquarters at Ravenna, Ky., was reported in the February issue, was born in Fleming county, Ky., and graduated in civil engineering from the University of Kentucky in 1925. He entered railway service in September, 1925, as an instrumentman at Ravenna. From 1931 to October, 1937, he was furloughed and worked for the National Park Service. He returned to the L. & N. on the latter date as instrumentman.

Track

J. R. Todd, assistant cost engineer on the Chesapeake & Ohio, has been appointed assistant supervisor of track, with headquarters at Newport News, Va.

R. W. Johnson has been appointed assistant roadmaster on the Los Angeles division of the Atchison, Topeka & Santa Fe, with headquarters at San Bernardino, Cal.

J. N. Fraine, transitman on the Canadian Pacific at Winnipeg, Man., has been promoted to roadmaster in charge of the Ft. William (Ont.) terminals, succeeding **D. McIntyre,** who retired on January 1 because of ill health.

W. L. Thompson has been appointed roadmaster on the Missouri-Kansas-Texas at Woodward, Okla., succeeding **J. H. Guest,** who has been transferred to Ft. Worth, Tex. **L. M. Wheeler** has been appointed acting roadmaster at Muskogee, Okla.

Cecil E. Cronk, section foreman on the Canadian Pacific at Chater, Man., has been promoted to roadmaster at Winnipeg, Man., succeeding **J. Hilland,** who has been transferred to Portage la Prairie, Man., relieving **B. Hardy,** who has been transferred to Winnipeg, replacing **W. H. Dunlop,** who retired on January 31.

E. Gunderson, roadmaster on the Canadian National at McBride, B.C., has been transferred to Albreda, B.C., succeeding **J. A. Leslie,** who has been transferred to Clearwater, B.C., relieving **A. A. Wocks,** who has returned to his former position as section foreman at Vancouver, B.C. **A. L. Peterson,** section foreman at Prince George, B.C., has been appointed acting roadmaster at McBride, replacing Mr. Gunderson.

J. C. Jacobs, supervisor of track on the Illinois Central at Decatur, Ill., has been transferred to East St. Louis, Ill., succeeding **H. H. Fisher,** who has been transferred to Reevesville, Ill. Mr. Fisher replaces **L. E. Webb,** who, in turn, has been transferred to Decatur, relieving Mr. Jacobs. **Richard Roach** has been appointed supervisor of track at Bluford, Ill., a newly created position. **P. R. Henderson,** supervisor of track at Springfield, Ill., has

Continued on page 228

MODERNIZING STATION INTERIORS?

DURABLE, ATTRACTIVE J-M MATERIALS MEET EVERY REQUIREMENT

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been transferred to Clinton, Ill., succeeding **L. E. Donovan,** who, in turn, has been transferred to Springfield, replacing Mr. Henderson.

Andrew Mooney, section foreman on the Canadian Pacific at Tuttle, Alta., has been promoted to relieving roadmaster at Empress, Alta., succeeding **R. B. Plowman,** roadmaster, who has been transferred to Bassano, Alta., relieving **G. E. Baines,** who has been transferred to Medicine Hat, Alta. Mr. Baines replaces **R. Kubicek,** who remains at Medicine Hat, but has been transferred to the territory formerly under the jurisdiction of **M. O'Malley,** who has retired from active service.

Robert H. Campbell, assistant track supervisor on the Southern, who has been promoted to supervisor of track at Oxford, N.C., as reported in the February issue, was born on October 24, 1918, at Greensboro, N.C. Following a public school education, Mr. Campbell studied railway engineering through the International Correspondence Schools. He entered railway service on July 23, 1934, as a section laborer on the Southern, being advanced to rodman on September 21, 1938. On January 1, 1939, Mr. Campbell returned to the position of section laborer. On March 9, 1940, he became a tamping machine operator and on July 1 of the same year he was appointed a student apprentice. He became assistant track supervisor on November 1, 1941, which position he held until his recent promotion to track supervisor, which was effective on January 1.

Russell B. Fetters, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Haileyville, Okla., was reported in the February issue, was born at Wellington, Kan., on September 9, 1899, and entered railway service on May 1, 1917, as clerk to the roadmaster on the Atchison, Topeka & Santa Fe at Wellington. On March 1, 1920, he went with the Rock Island as a chainman at Herington, Kan., and on November 1, 1925, he was advanced to instrumentman. Mr. Fetters was promoted to assistant engineer at Herington on April 1, 1929, and on February 1, 1930, he was appointed resident engineer at Lawson, Mo., on the construction of the Coburn-Birmingham line. On January 1, 1933, he was appointed track supervisor at Topeka, Kan. Mr. Fetters was transferred to Omaha, Neb., on December 15, 1939, where he remained until his recent promotion, effective January 1.

Howard W. Seeley, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Akron, Ohio, was reported in the February issue, was born at Union City, N.J., on April 29, 1913, and graduated from Lehigh University in 1935. He entered railway service on July 6, 1935, as an engineering apprentice at Cresson, Pa., and in January, 1936, he was promoted to assistant on the engineering corps at Erie, Pa., later being transferred to Pittsburgh, Pa., and Dennison, Ohio. In March, 1937, Mr. Seeley was advanced to assistant supervisor of track on the St. Louis division at Terre Haute, Ind., and in June, 1938, he was appointed assistant on the engineering corps at Terre Haute. He was transferred to Ft. Wayne, Ind., in January, 1939, and in August, 1939, he was promoted to assistant supervisor of track at Lock Haven, Pa. Mr. Seeley was transferred to Coshocton, Ohio, in June, 1940, where he remained until his recent promotion.

Charles Hetisimer, whose promotion to supervisor of track on the Chesapeake & Ohio, with headquarters at Richmond, Ind., was reported in the January issue, was born at Miami, Ohio, on May 30, 1904, and entered railway service on August 19, 1919, as a section laborer on the C. & O. at Cottage Grove, Ind. On October 18, 1924, he was promoted to section foreman at Kitchell, Ind., which position he held until his promotion to supervisor of track, effective December 1.

John B. Johnson, whose promotion to roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Terre Haute, Ind., was reported in the January issue, was born in Sweden on February 3, 1890, and entered railway service in March, 1907, as a section laborer on the H. & D. division of the Milwaukee. In 1909 he was promoted to section foreman and in 1913 he became a brakeman. In 1918 he transferred to the car department and was later promoted to car inspector. In 1931 he was furloughed and returned to the track department. Mr. Johnson was promoted to extra gang foreman in 1935 and in 1937 he was advanced to general foreman of extra gangs, which position he held until his recent promotion.

Erwin P. Sax, whose promotion to roadmaster on the Denver & Rio Grande Western, with headquarters at Minturn, Colo., was reported in the January issue, was born at LaJunta, Colo., on June 13, 1897, and entered railway service in June, 1915, as a section laborer on the Los Angeles & Salt Lake (now part of the Union Pacific) at Salt Lake City, Utah, later being promoted to foreman. In January, 1917, he went with the Denver & Rio Grande Western as a brakeman at Magna, Utah, and then went with an electric line at Los Angeles, Cal. From June, 1918, to August, 1919, Mr. Sax served in the U. S. Army, returning to the D. & R. G. W. on the latter date and serving as construction foreman, extra gang foreman and section foreman at Dividend, Utah, and later at Salt Lake City until his recent promotion.

Lawrence F. Shields, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Carrothers, Ohio, was reported in the January issue, was born at Cincinnati, Ohio, on September 4, 1910, and attended the University of Cincinnati from 1929 to 1934. He entered railway service on February 5, 1936, as an engineer apprentice on the Pennsylvania at Buffalo, N.Y., later being transferred to Niles, Ohio. In November, 1936, he was appointed assistant on the engineer corps at Cresson, Pa., and in March, 1937, was transferred to Alliance, Ohio. Mr. Shields was transferred to Erie, Pa., on May 1, 1938, to Logansport, Ind., on November 16, 1938, and to the office of the chief engineer maintenance of way at Chicago on April 1, 1940. On June 1, 1940, he was promoted to assistant supervisor of track at Enola, Pa., and on October 28, 1940, he was transferred to Newport, Pa., where he remained until his recent promotion, effective December 22.

James L. Tedesco, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Cadillac, Mich., was reported in the January issue, was born at South Amboy, N.J., on October 21, 1899. He entered railway service on October 6, 1915, as a messenger on the Trenton division at South Amboy and on January 16, 1917, he became a trackman at that point. On January 1, 1919, he was promoted to assistant track foreman and on April 26, 1920, he was advanced to track foreman. On February 15, 1929, Mr. Tedesco was promoted to general foreman on the Long Island Railroad and worked on various grade crossing elimination jobs and also the rebuilding of Montauk yard at Montauk Point, L.I. On March 4, 1937, he was promoted to assistant supervisor of track on the Pennsylvania at Williamsport, Pa., and on April 12, 1938, he was transferred to Lock Haven, Pa. Mr. Tedesco was transferred to Downingtown, Pa., on June 5, 1939, where he remained until his recent promotion, effective December 16.

A. J. Roper, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Richmond, Ind., was reported in the January issue, was born at Vandalia, Ill., on August 26, 1904, and entered railway service on August 23, 1923, as an extra gang timekeeper on the St. Louis division of the Pennsylvania. On September 1, 1926, he was appointed temporary yard foreman at Collinsville, Ill., and on January 1, 1929, he was advanced to permanent track foreman at Rose Lake yard (East St. Louis, Ill.) Mr. Roper was transferred to Caseyville, Ill., in November, 1934, and to Greenville, Ill., in January, 1935. In February, 1937, he was promoted to assistant supervisor of track at Valparaiso, Ind., and a year later he was appointed acting supervisor of track at Toledo, Ohio. In August, 1938, he returned to Greenville as a track foreman and in June, 1939, he was promoted to acting supervisor of track at Richmond. In January, 1940, Mr. Roper was appointed assistant supervisor of track at Canton, Ohio, which position he held until his recent promotion.

O. R. Bridges, assistant roadmaster on the Little Rock-Louisiana division of the Missouri Pacific, has been promoted to roadmaster, with headquarters at Monroe, La., succeeding **H. H. Gudger,** who has been transferred to Pueblo, Colo. Mr. Gudger relieves **Lewis Walter Johnson,** who retired on February 1. **M. McGehee,** extra gang foreman on the Little Rock division, has been advanced to assistant roadmaster, replacing Mr. Bridges.

Mr. Johnson was born at Sedan, Kan., on January 10, 1875, and entered railway service in April, 1893, as an extra gang laborer on the Colorado division of the Union Pacific. A year later he was promoted to section foreman at Luray, Kan.

Continued on page 230

Complete Tie-Renewal Programs Despite Existing Scarcity of Labor!

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In spite of faster trains schedules . . . in spite of scarcity of labor . . . in spite of increased wages . . . you can not only finish this year's tie renewal program sooner—but actually save thousands of dollars . . . by using Woolery Tie Cutters!

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In December, 1897, he went with the Missouri Pacific as a section laborer at Sheridan Lake, Colo., and five months later, he was advanced to section foreman at Horace, Kan. In June, 1907, Mr. Johnson was appointed storekeeper at Pueblo and in 1910 he was appointed tie inspector on the Colorado division. In August, 1911, he was promoted to roadmaster, with headquarters at LaCrosse, Kan., and he was subsequently transferred to Hoisington, Kan., in 1916, to Horace in 1934 and to Pueblo in 1939.

Kenneth Short has been appointed supervisor of track on the New York Central (Big Four) at Galion, Ohio, succeeding **Ira Walker,** who has been transferred to Bellefontaine, Ohio, relieving **L. W. Moss,** whose appointment as supervisor of bridges and buildings, with headquarters at Mt. Carmel, Ill., is reported elsewhere in these columns. **Harry H. Wise,** supervisor of track at Galion, Ohio, has been transferred to Wabash, Ind. **Virgil Acrea,** assistant supervisor of track at Middletown, Ohio, has been transferred to Anderson, Ind.

Mr. Short was born at Clinton, Ind., on February 9, 1886, and entered railway service on March 2, 1903, as a section laborer on the Illinois division of the Big Four, later being advanced successively to section foreman, yard foreman and extra gang foreman on that division. On July 20, 1941, Mr. Short was promoted to assistant supervisor of track at Anderson, Ind., which position he held until his recent promotion, effective January 1.

Bridge and Building

John E. Heck, bridge inspector on the Chesapeake & Ohio at Peru, Ind., has been promoted to assistant supervisor of bridges and buildings on the Ashland division, with headquarters at Ashland, Ky.

Gerald Linn, assistant supervisor of bridges and buildings on the Chicago & North Western at Huron, S.D., has been promoted to assistant general bridge inspector, with headquarters at Chicago, succeeding **William Wilbur,** who has been called to service.

P. J. Scherer, assistant supervisor of bridges and buildings on the Los Angeles division of the Southern Pacific, has been promoted to supervisor of bridges and buildings on the Rio Grande division, with headquarters at El Paso, Tex., succeeding **J. H. DeBord,** who retired on December 31. Mr. DeBord entered railway service with the Atchison, Topeka & Santa Fe in 1902 and in 1907 went with the Southern Pacific as a water service helper. In 1912 he was promoted to supervisor of bridges and buildings.

Charles Francis Gilbert, whose promotion to supervisor of bridges and buildings on the Chesapeake & Ohio, with headquarters at Peru, Ind., was reported in the January issue, was born at Peru on April 14, 1885, and entered railway service on May 7, 1923, as a carpenter helper on the C. & O. Three months later he was promoted to second class carpenter and on January 2, 1924, he was advanced to first class carpenter. On November 3, 1925, Mr. Gilbert was promoted to bridge and building foreman, which position he held until his recent promotion, effective January 1. All of his service has been on the Chicago division of the C. & O. at Peru.

George C. Blackaller, whose promotion to master carpenter on the Denver & Rio Grande Western, with headquarters at Alamosa, Colo., was reported in the January issue, was born at Minneapolis, Minn., on September 8, 1909 and graduated from Washington State College in 1935. He entered railway service during the summer of 1934, serving four months as a chainman with the Chicago, Milwaukee, St. Paul & Pacific at Greenough, Mont., and after graduation in June, 1935, he returned to the Milwaukee as a rodman at Miles City, Mont. In May, 1936, he was promoted to instrumentman at Ottumwa, Iowa, and in October, 1939, he went with the Denver & Rio Grande Western as an assistant engineer at Salt Lake City, Utah. In August, 1941, Mr. Blackaller was advanced to acting master carpenter at Alamosa, which position he held until his recent promotion.

Edward H. Tustin, whose retirement as bridge inspector of the Northern lines of the Illinois Central, with headquarters at Chicago, was reported in the February issue, was born at Chicago on December 19, 1871, and entered railway service on March 19, 1888, as a clerk in the Illinois Central freight house at Chicago. In 1892, he was transferred to the maintenance of way department as a carpenter and on November 9, 1893, he went with the Southern Pacific at Dunsmuir, Cal. He returned to the Illinois Central in the bridge department at Chicago on March 9, 1897. From August 4, 1903, to August 22, 1907, he worked for various contractors on railroad construction and steel erection. He returned again to the Illinois Central on the latter date, serving in the maintenance of way and bridge departments at Chicago as a carpenter, bridgeman, assistant foreman, foreman and general foreman. In 1927, Mr. Tustin was promoted to bridge inspector, Northern lines, which position he held until his retirement.

James A. Crawford, bridge and building master of the Saskatoon division of the Canadian National, with headquarters at Saskatoon, Sask., has retired. Mr. Crawford was born at Oro Station, Ont., on September 14, 1878, and entered railway service on October 1, 1900, as a bridgeman and carpenter at Winnipeg, Man., on the Manitoba division of the Northern Pacific (now part of the Canadian National). In June, 1901, he went with the Canadian Northern (now also part of the Canadian National) and in July, 1902, he was advanced to bridge and building foreman, with headquarters at Port Arthur, Ont. Mr. Crawford was promoted to bridge and building master of the Saskatoon division, with headquarters at Saskatoon, Sask., in September, 1910, and in November, 1928, he was transferred to the British Columbia district, with headquarters at Kamloops, B.C. In June, 1933, he was transferred back to Saskatoon, where he remained until his retirement.

Francis E. Shanklin, whose retirement as supervisor of bridges and buildings on the Chicago & North Western, with headquarters at Chadron, Neb., was reported in the January issue, was born in Linn county, Iowa, on July 29, 1871, and entered railway service in October, 1893, as a stone cutter on the Chicago, Milwaukee, St. Paul & Pacific. In April, 1896, he went with the North Western as a stone cutter on the Madison division and five months later, he returned to the Milwaukee as a stone cutter, later being promoted to mason foreman. In May, 1900, Mr. Shanklin went with the North Western as a mason foreman at Boone, Iowa, and in October, 1906, he was promoted to general foreman. In January, 1920, he was advanced to supervisor of bridges and buildings, with headquarters at Chadron, and in April, 1923, he was transferred to Madison, Wis. A year later, he was transferred back to Chadron, where he remained until his retirement, effective December 1, 1941.

L. W. Moss, supervisor of track on the New York Central (Big Four) at Bellefontaine, Ohio, has been appointed supervisor of bridges and buildings, with headquarters at Mt. Carmel, Ill., succeeding **E. M. Roberts,** who has been transferred to Anderson, Ind., replacing **C. O. Henry,** whose transfer to Cleveland, Ohio, was reported in the January issue. **Carl R. Taggart,** bridge and building foreman at Indianapolis, Ind., has been promoted to supervisor of bridges and buildings, with the same headquarters, replacing **Charles W. Heuss,** who retired on December 31.

Mr. Taggart was born at Terre Haute, Ind., on April 15, 1893, and entered railway service on October 28, 1908, as a bridge and building carpenter on the Big Four. From 1917 to 1919, he served 22 months with the U. S. Army as master engineer in Company B of the 32nd Engineers, spending a year overseas. In the latter year, he returned to the Big Four as bridge and building foreman at Indianapolis, which position he held until his recent promotion.

Mr. Heuss was born in Jay County, Ind., on December 28, 1871, and entered railway service in March, 1893, as a bridge carpenter on the Big Four at Union City, Ind. On December 15, 1893, he went with the Texas & Pacific at Marshall, Tex., as a carpenter and on May 1, 1895, he returned to the Big Four as a bridge and building carpenter at Union City. Mr. Heuss was promoted to foreman on October 1, 1899, and on April 1, 1904, he was advanced to supervisor of bridges and buildings at Indianapolis, which position he held until his retirement.

Obituary

Curtis E. Knickerbocker, former chief engineer of the New York, Ontario & Western at Middletown, N.Y., died on February 15 at his home in New York after a week's illness, at the age of 74. Mr. Knickerbocker was born on November 17, 1867, at Morrisville, N.Y., and was graduated from Princeton University in 1891. He was engineer maintenance of way of the New York, Ontario & Western from 1903 to 1910 and during 1911 he

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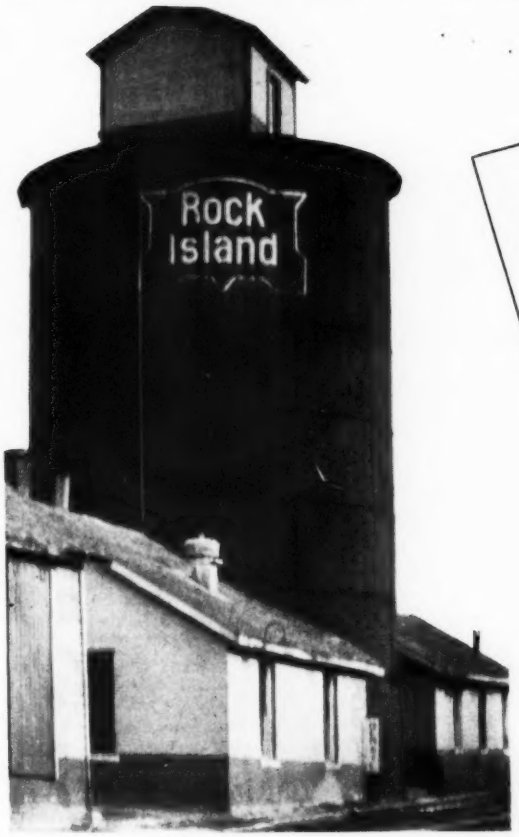

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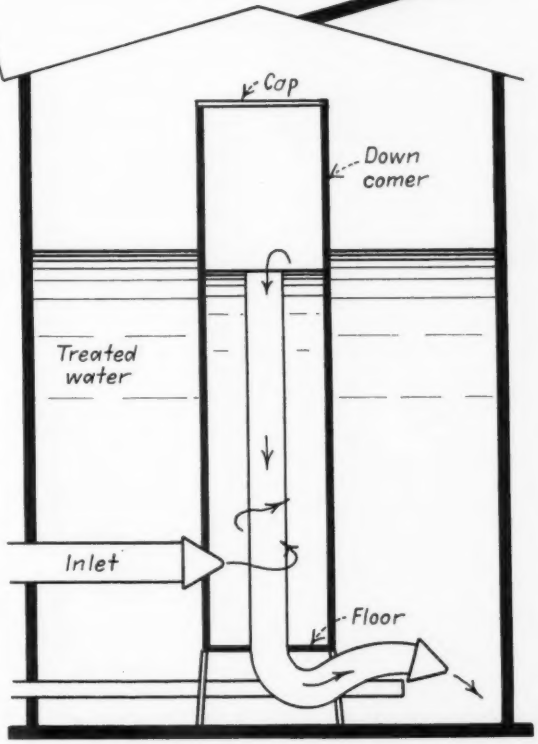

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served as chief eengineer. From September, 1914, to May, 1918, he was with the Interstate Commerce Commission, and on the latter date he went with the United States Railroad Administration, becoming regional engineer, Eastern region, Division of Liquidation, U. S. R. A., at New York on March 1, 1920.

Gustave A. Laubenfels, district engineer of the former Iowa district of the Chicago, Burlington & Quincy, with headquarters at Burlington, Iowa, who retired on May 1, 1932, died at the age of 82 at his home in Burlington on February 4, as the result of injuries received in a fall several days before.

George W. Rear, engineer of bridges of the Southern Pacific, Pacific Lines, with headquarters at San Francisco, Cal., died at the Southern Pacific hospital in that city on February 10 after an illness of several weeks. Mr. Rear was born in the Province of Ontario on June 13, 1873, and attended Campbellford Collegiate Institute from 1886 to 1889. In the latter

George W. Rear

year, he entered railway service as a student in engineering with the Midland Railway (now part of the Canadian National) and in 1896 he became a foreman of bridge construction on the Grand Trunk (now also part of the Canadian National), later serving as chief clerk of maintenance in the office of the superintendent. In July, 1901, he went with the Southern Pacific as foreman of steel bridge erection and on April 1, 1902, he was appointed assistant general bridge inspector. Mr. Rear was promoted to general bridge inspector, with headquarters at San Francisco on August 15, 1905, and in March, 1922, he was appointed engineer of bridges, with the same headquarters, the position he held until his death. Mr. Rear has been an active member of the American Railway Bridge and Building Association for many years and served as president of that organization in 1916. He was president of the Pacific Railway Club in 1918.

Evert C. Blundell, who retired on November 1, 1938, as assistant to the executive vice-president, in charge of track maintenance, of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, Minn., died on February 2 at Glendale, Cal. Mr. Blundell was born in Le Sueuer County, Minn., on June 19, 1867, and entered railway service in 1880 with the Chicago & North Western at Highmore, S.D. He subsequently served the Sioux City & Northern (now part of the Great Northern) and the Pacific Shore Line (now part of the Chicago, Burlington & Quincy) from 1889 to 1896, and the Union Pacific from 1896 to 1898. In the latter year, he went with the Omaha, and later was promoted to roadmaster, serving in that capacity at Itasca, Wis., and Eau Claire. In 1912, he was advanced to assistant superintendent at Eau Claire, and in January, 1913, he was promoted to division superintendent, with headquarters at Omaha, Neb. Mr. Blundell was further advanced in May, 1933, to assistant to the vice-president and general manager, with supervision over all track maintenance matters, and with headquarters at St. Paul. His title was later changed to assistant to the executive vice-president, the position he held until his retirement on November 1, 1938.

Supply Trade News

General

The **Pomona Pump Co.,** Pomona, Cal., has purchased the Westco Pump division of **Micro-Westco, Inc.,** Bettendorf, Iowa. The newly acquired business will be operated as Pomona Pump Co., Westco division, at 2621 Locust street, St. Louis, Mo., and manufacture will be continued from the St. Louis plant of the Pomona Pump Co. Management and key presonnel of Westco will be transferred to St. Louis to continue the manufacture and distribution of the complete line of Westco pumps.

Personal

Henry H. Howard, manager of the engine sales division of the **Caterpillar Tractor Company,** has been called to Washington to take up temporary wartime duties in the War Department as consultant to Col. J. K. Christmas of the Ordnance department.

Walter Geist, vice-president of **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., has been placed in charge of a centralized sales administrative department, created to co-ordinate the company's sales policies.

R. F. Gordon, for the past several years assistant sales manager, has been appointed sales manager of the **Weir Kilby Corporation** of Cincinnati, Ohio, to succeed **J. K. Lansdowne,** vice-president and sales manager, who is retiring after more than 30 years' service with that company.

Harmon S. Eberhard, chief engineer of the **Caterpillar Tractor Company,** Peoria, Ill., has been elected a vice-president succeeding **Thomas J. O'Connor,** whose death on January 23, is reported elsewhere in these columns and **G. E. Burks,** assistant chief engineer, has been promoted to chief engineer, succeeding Mr. Eberhard. **C. G. A. Rosen** has been appointed director of a newly created research department.

A. J. Reading has entered the service of the **Elastic Rail Spike Corporation,** New York, as assistant sales engineer, and will establish a branch office at 4719 Korte avenue, Dearborn, Mich. Mr. Reading is a graduate civil engineer of Michigan State college and had been employed by the Pere Marquette as an assistant engineer in the maintenance of way and bridge and building departments since March, 1928.

George G. Prest, who was associated for a number of years with the late **George H. Goodell,** railway equipment manufacturers' agent at St. Paul, Minn., has been appointed representative in Minneapolis and St. Paul for the **National Lock Washer Company,** Newark, N.J., and the **Q and C Company,** New York. After his discharge from the United States Navy in the first World War, Mr. Prest studied mechanical engineering for two years at the University of Minnesota. He was then employed by the American Hoist and Derrick Company of St. Paul for about thirteen years and was later representative of the Franklin County Coal Corporation of Chicago. For the past five years, he was associated with Mr. Goodell at St. Paul.

W. Lyle McDaniel, assistant chief engineer of the **Massey Concrete Products Company,** Chicago, has been promoted to chief engineer, with headquarters at Chicago, succeeding **Earl C. Alexander,** whose death on February 9 is reported elsewhere in these columns. Mr. McDaniel is a graduate of the University of Pittsburgh, was for some years with the Pennsylvania Railroad and later with the Chicago Union Station Company. He has been with the Massey Concrete Products Company since 1920 in various sales and engineering capacities including that of resident manager at Cleveland, Ohio. Just prior to his recent appointment he served for three years as assistant chief engineer.

Obituary

Earl C. Alexander, chief engineer of the Massey Concrete Products Company, with headquarters at Chicago, died in that city on February 9.

Donald G. Sherwin, a vice-president and director of the Caterpillar Tractor Company, Peoria, Ill., died at his home in San Leandro, Cal., on February 11.

Thomas J. O'Connor, vice-president in charge of production and a member of the board of directors of the Caterpillar Tractor Company, died suddenly of a heart attack at his home on January 23. He was 48 years of age.

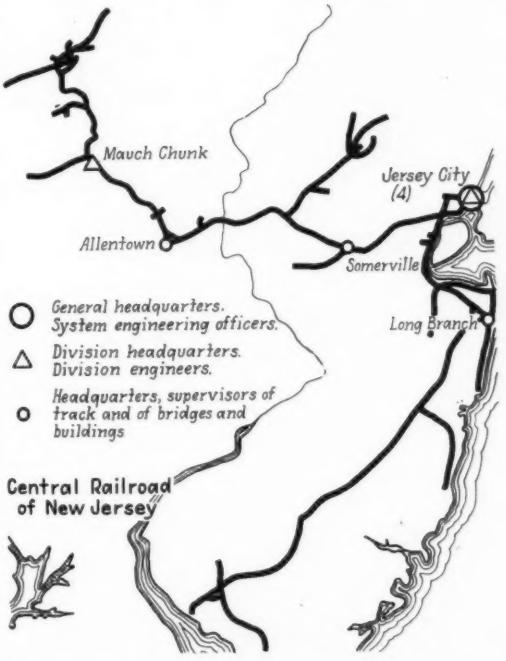
August Ziesing, who retired as president of the American Bridge Company in April, 1927, died on February 16 at his home in Glencoe, Ill. Mr. Ziesing was born at Peru, Ind., on February 19, 1858, and graduated from the University of Illinois in 1878. After engaging in bridge construction and structural engineering work for several years, he became a consulting engineer at Chicago, specializing in railway structures. In 1900 he went with the American Bridge Company as vice-president and western manager and in September, 1905, he was elected president.

TO RAILWAY SUPPLY MANUFACTURERS

"American Ingenuity"

"Boss, it's a dirty shame that we've got to close up shop just when the railways are beginning to make some money and are able to buy our product. It's the year we've been waiting a long time for. And when it comes, we can't handle their business," said the star railway salesman to his railway sales manager.

"Why can't we?" queried the sales manager.



Railway Engineering and Maintenance Goes Every Month to the **General Superintendent,** to the **Chief Engineer,** to the **Assistant Chief Engineer,** to the **Engineer Maintenance of Way,** to the **2 Division Engineers,** to the **4 Track Supervisors** and to **8 Other Subordinate Officers** Who Are in Training for Promotion to Supervisory Positions on the Central Railroad of New Jersey.

"Because we can't get any more aluminum. Don't you know the government's taking all of it to make 'calling cards' to send the Japs."

"That's true, Bill. But what of it? That doesn't mean we're going to give up."

"What else can we do, Boss?"

"Re-design our equipment to avoid the need for aluminum."

"But we can't do that."

"Why can't we? We're already doing it. Our engineering department has been working on it for months. They saw it coming."

"But they aren't getting anywhere, are they?"

"They certainly are. We'll be in production with an entirely new model in 30 days. We've built a few already—and they're honeys."

"Gee, that's great. I didn't know it."

"Bill, a philosopher years ago cautioned the people to 'never sell America short'. And don't ever question the ingenuity of American industry in adapting itself to new conditions—least of all your own company."

"You're right, Boss. You've taught me a lesson. As soon as you give the word, I'll start pounding the pavements harder than ever, for a lot of our good railroad friends are as worried as I was and I want to tell them we're going to meet their needs."

"That's the spirit, Bill. Tell them as fast as you can."

"And, Boss, how about those I can't get around to see for a while?"

"We'll tell them in the advertising pages of *Railway Engineering and Maintenance.*"

"That's fine, for it reaches all of them out on the line as well as in the office. And they're reading it today as never before, looking for new ideas. With its coverage and a new model, we'll not close up shop but we'll need an addition to the plant."

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

SKILSAW
CUTS FASTER!
...cuts hours off maintenance schedules!

SKILSAW DRILLS

for wood boring, steel drilling and reaming!

Powered for deep wood boring in timbers — for lag spikes and hook bolts, for drilling and reaming in steel and a hundred other uses. Stronger, more durable, more powerful construction throughout. 23 MODELS

Bridge and Building Crews get more jobs done . . . in far less time . . . when they're equipped with fast-cutting SKILSAW. It speeds all sawing of wood, metal, stone and compositions . . . helps crews keep ahead of today's stepped-up maintenance and construction schedules.

SKILSAW goes right to each job for greatest savings in time and labor. Cuts daps in ties, cuts timbers, saws all lumber on bridges, trestles, guard rails, buildings and maintenance of way work.

SKILSAW is lighter, yet more powerful . . . faster and easier to use. That's why it's so efficient, so economical for both large and small crews. 9 POWERFUL MODELS. Ask for a demonstration.

Skilsaw, Inc.
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SKILSAW PORTABLE ELECTRIC TOOLS
★ FOR THE DEFENSE OF AMERICA ★

LeTourneau Off-Track Equipment
WORKS 50 TO 60 MINUTES HOURLY
. . . Cuts Maintenance Time and Cost

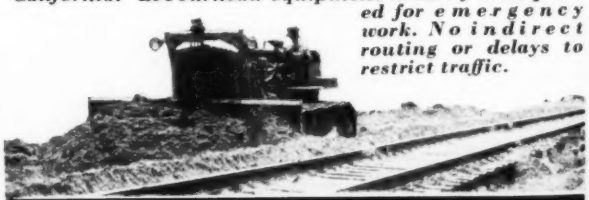
LeTourneau Carryall Scrapers work full shifts without delays, building a new grade for the C & O Railroad near Ashland, Ky. These units are one-man operated. They dig, haul and spread material in one continuous operating cycle with one piece of equipment.

LeTourneau Carryall Scrapers and Dozers work off the track . . . eliminate the need for big work trains and continual switching or construction of temporary spur tracks to keep revenue trains on schedule. They enable you to work more minutes per hour . . . more hours per shift than ever before on repair and maintenance work.

LeTourneau equipment is built to take the punishment of rough emergency work as well as everyday jobs. When breakdowns do occur, most repairs can be quickly made on the job with a welding torch; no long, expensive shutdowns.

Investigate the LeTourneau earthmoving method now used universally by contractors on the construction of more than a million miles of low-cost roads. This same method is now used by many leading railroads. It can help you cut maintenance time and cost. Write for illustrated folder No. A-284 showing LeTourneau off-track equipment on railroad jobs. Do it now!

A LeTourneau Dozer fills in a grade washout after a flood along the main line of the Southern Pacific Railroad in California. LeTourneau equipment is easily transported for emergency work. No indirect routing or delays to restrict traffic.

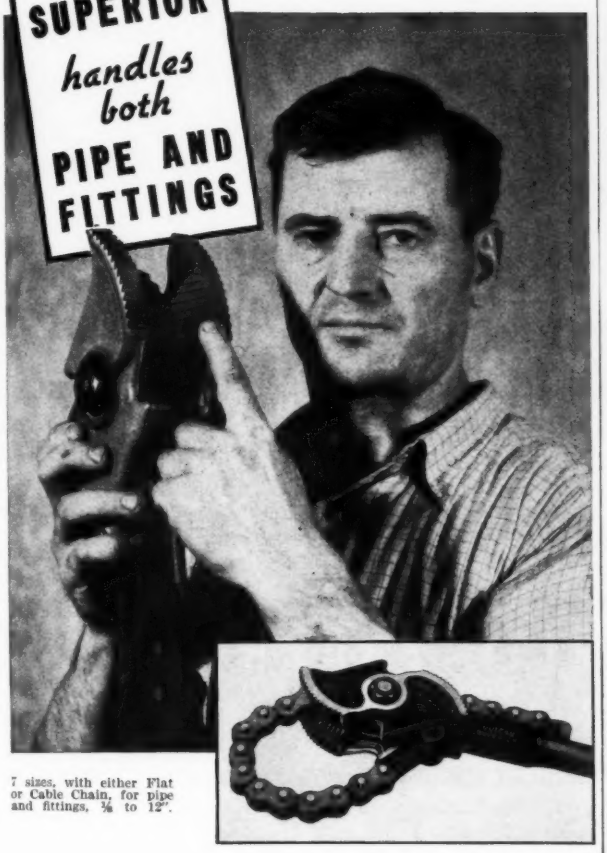


LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

CABLE ADDRESS "BOBLETORNO"

CARRYALL® SCRAPERS, ANGLEDOZERS®, BULLDOZERS, ROOTERS®, POWER CONTROL UNITS, TRACTOR CRANES, PUSHDOZERS, SHEEP'S FOOT ROLLERS, TOURNAPULLS®, TOURNATRAILERS®, TOURNACRANE. ®Name Reg. U.S. Pat. Off.

VULCAN SUPERIOR *handles both* PIPE AND FITTINGS



7 sizes, with either Flat or Cable Chain, for pipe and fittings, ⅛ to 12".

• "Vulcan Superior" handles both pipe and fittings with amazing ease. You can switch from one to the other *instantly*—no parts to change, no adjustments to make. The "V" recess in the jaws is the answer—it assures quick and positive grip on all fittings.

"Vulcan Superior" Jaws are reversible. When teeth begin to wear, simply loosen the Through-Bolt and reverse the Jaws. Ask your supplier for this fully guaranteed tool, or write for descriptive folder.

WILLIAMS' "VULCAN" VISES

Made entirely of Tough *Wrought* Steel

"VULCAN SUPERIOR"

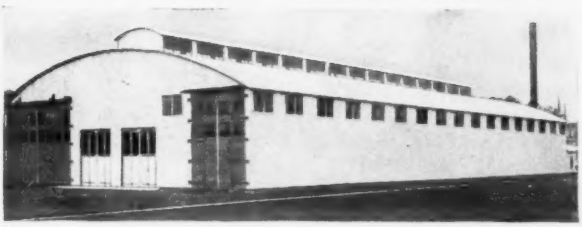
Adjusting handle above the bench for extra speed and convenience. Jaws *reversible* for double service. Two sizes for pipe, ⅛ to 4½".

The *original* Chain Pipe Vise — small — compact — unbreakable — fast in action. Four sizes for pipe, ⅛ to 8".

"VULCAN"

J. H. WILLIAMS & CO., 225 Lafayette St., NEW YORK, N. Y.

AMERICAN RAILROADS MODERNIZE WITH BUTLER READY-MADE STEEL BUILDINGS

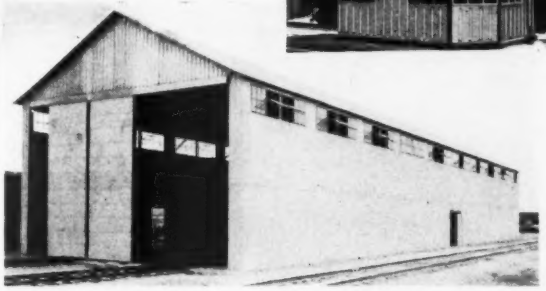


At top—Lined interior of steam heated 90'x200'x22' Butler steel building (Above) housing fruit handling docks.

At left—Butler motor track car and tool house.

At right—Butler freight car scale house.

Below—Butler 40'x160'x22' railway car repair shop which survived a tornado.



Keeping the greatest volume of freight in history moving swiftly and uninterruptedly along the **248,000 MILE BATTLE LINE** of **AMERICAN RAILROADS** calls for ever expanding facilities of the modern type. Perishable food cars, for instance, are no longer unloaded outside in freezing temperature. Instead, cars are switched to docks housed in steam heated Butler Steel Buildings.

Many railroads have long since found that Butler Steel Buildings—factory fabricated for speedy erection—lessen the investment and quicken the charge-off. Structurally strong, fire-safe, readily insulated, heated or air-conditioned—*they permanently house space for freight handling, materiel storage, warehousing, equipment repairs, machine shops, maintenance of way equipment, etc.*

There are three helpful Butler Steel Building Books. One shows more than a hundred Butler Buildings as used in a score of industries. Another, Butler Boulevard Buildings (steel inside and out). The third, Butler made USS Panelbilt Buildings.

For prompt handling, address all inquiries to 1238 Eastern Ave., Kansas City, Mo., or 938 Sixth Ave., S.E., Minneapolis, Minn.

Other sales offices: Washington, New York, Chicago, Atlanta, Shreveport and Houston.

Also representatives in other principal cities.

BUTLER MANUFACTURING COMPANY

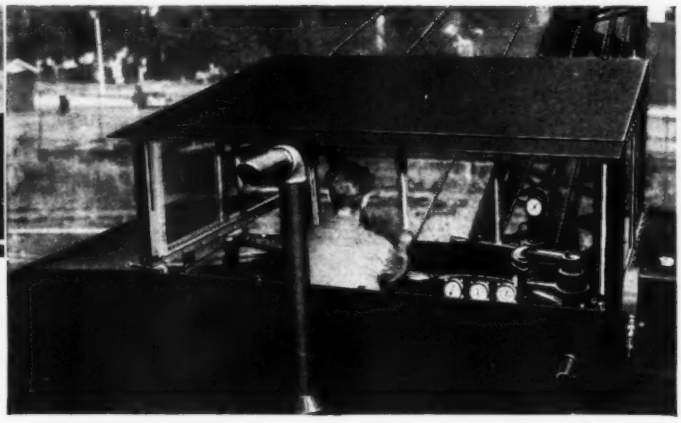
FACTORIES

KANSAS CITY, MO. GALESBURG, ILLS.

MINNEAPOLIS, MINN.

"We Get More Work Out of Our I.B. Cranes"

Users praise the steady, low cost, material handling ability of I. B. Cranes.



Equipped with hook, magnet, or bucket, I. B. Cranes do a top-notch job under all conditions.

Above right: This close-up of the rear window shows the perfect ventilation and 360° visibility offered the operator in the new, patented monitor type cab which is standard on all Industrial Brownhoist gasoline and Diesel cranes up to 40 tons capacity. Monitor-type cabs also reduce motor noise and heat thus increasing the operator's comfort. Write today for further facts.

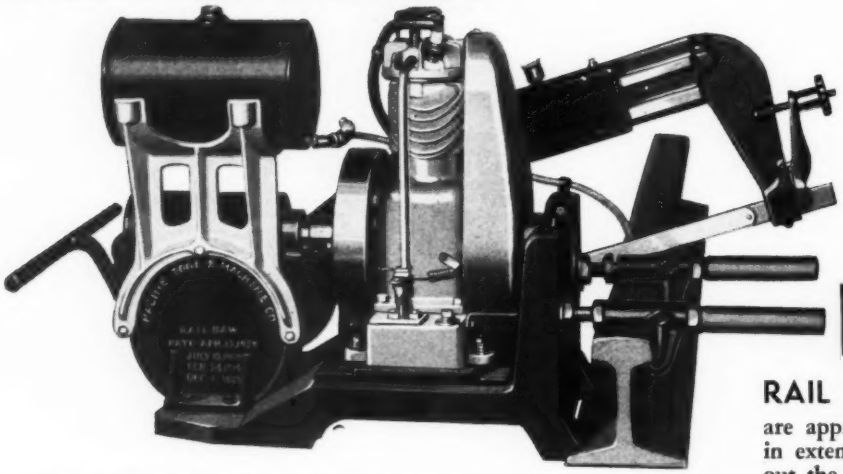
BAY CITY, MICHIGAN • DISTRICT OFFICES: NEW YORK PHILADELPHIA, PITTSBURGH, CLEVELAND, CHICAGO

INDUSTRIAL BROWNHOIST

BUILDS BETTER CRANES

RACINE

Cuts Rails *Safer at Lower Costs*



RACINE

RAIL CUTTING MACHINES

are approved by rail experts and are in extensive use in railroads throughout the country. Due to the development and production of special heat-treated alloy steel blades, we have been able to effect a marked reduction in cutting time and real saving in the cost of doing this work.

Extensively used for cutting rails in track; installing insulated joints; fitting up switches, frogs, and crossings; end cropping operations and for reconditioning old rails in storage yards. Make straight cuts exactly where required. No burning or shattering of grain structure in rails.

The gasoline motor powered machine, shown above, is *complete* in itself. All models easily handled by two men. Capacities range from 6" rail to 9"-flanged rail—gasoline, electric, or air driven types available.

These saws do the work correctly

Racine Tool and Machine Co., 1738 State St., Racine, Wis.

Guard—— YOUR WATER SUPPLY SYSTEM

Beware of sabotage! Remember, in an emergency, your water system may save highly valuable materials, buildings and even lives.

Neglect is almost as destructive as sabotage. If your water supply system is not in tip top order, call in Layne and have necessary repairing and reconditioning done at once. Materials, except for strictly war work, may not be available later. Maintaining present equipment is real conservation.

If you require more water, arrange for additional wells and pumps without delay. Better call in a Layne engineer. He will cooperate with you in planning your additional water supply so as to use the minimum amount of materials essential to war work, yet give you an adequate, efficient and long lived installation. Layne wells and pumps are designed for your requirements regardless of size. They are noted for their high efficiency and trouble free service. They are serving all types of industries, municipalities both large and small, army and navy needs, training camps, flying fields and munitions plants.

Write, wire or telephone for further facts.

LAYNE & BOWLER, INC.
Memphis, Tennessee

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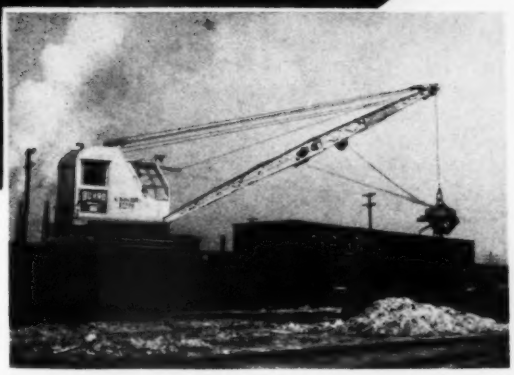
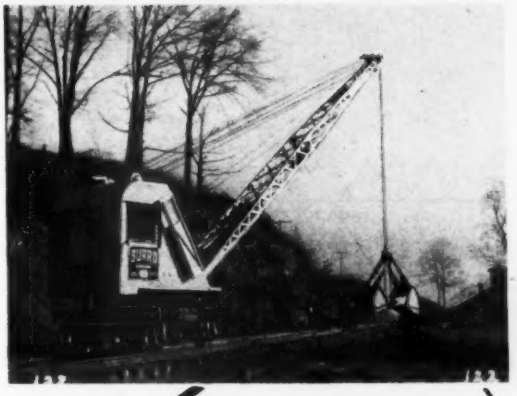
WORLD'S LARGEST WATER DEVELOPERS

Road work with BURRO Cranes





New trackage to new plants, improvements on the line and the ever present maintenance of way, all call for equipment that is economical, and with a wide range of utility. Burro Cranes have many features which make them "tops" in each category.

● Our Booth is 56 at the National Railway Appliance Association, Palmer House, Chicago.

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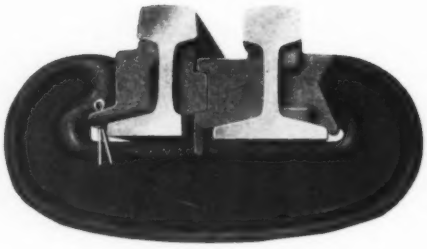
TO ASSURE SAFETY AND ECONOMY



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Q & C UNIVERSAL TYPE GUARD RAIL CLAMPS

designed to adequately meet the demands of present day heavy traffic conditions.

Our clamps are fitted with a drop forged, heat treated, steel yoke of "I" Beam construction; one size of yoke suitable for a large range of rail sections.

OTHER Q AND C APPLIANCES:

Switch Point Guards—One Piece Manganese Guard Rails—Wheel Stops—Derails—Gauge Rods—Compromise Joints—Car Replacers—Snow Flangers and Plows—Skid Shoes—Anti-Slip Rail Tongs—Flangeway Brackets—Rail Benders—Electric Snow Melters—Gauging Tools.

Q AND C

THE Q AND C CO.

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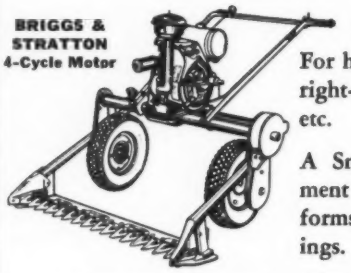
NATIONAL RAILROAD SPECIAL SICKLE BAR MOWER



For heavy weeds on the right-of-way, in yards, etc.

A Snow Blade attachment for cleaning platforms, walks and crossings.

RAILROADS USE MORE NATIONAL SICKLES THAN ALL OTHER MAKES COMBINED

Also Power Lawn Mowers, Lawn Sweepers, and Industrial Sweepers.

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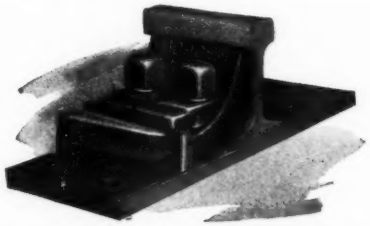

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Redesigned for super-strength to meet the requirements of modern high-speed traffic.

WE MANUFACTURE

Frogs—Switches—Crossings—Guard Rails—Gage Rods—Rail Braces—Compromise Joints—Balkwill Crossings—Articulated Crossings—Samson Switches—Betts Switches and Security Track Designs.

Our engineers are available at all times to assist the railroads in their maintenance problems. Call at our exhibit or write us.

MORDEN FROG and CROSSING WORKS
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Representatives in:
Cleveland, Ohio
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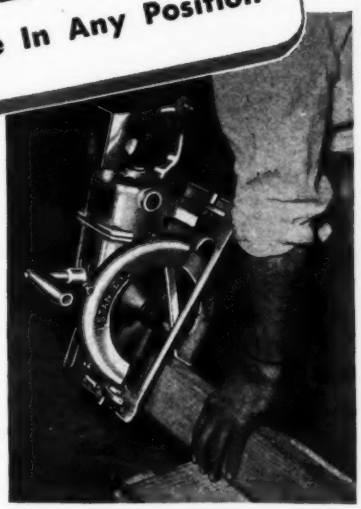
POWER
For The Big Jobs

BALANCED
For Use In Any Position



STANLEY W9 ELECTRIC SAW

TRADE STANLEY MARK

W9 Safety Saw cuts full 3¼" deep — plenty of power. Well-balanced for light work too. It's practically a jack-of-all-trades for any sawing on the job. Knocks hours from slow, expensive hand sawing. Can be driven from a small portable generator, or plugged in any light socket. Stanley Saws are available with capacities from 2½" to 6". Stanley Electric Tool Division, The Stanley Works, 160 Elm Street, New Britain, Connecticut.

STANLEY ELECTRIC TOOLS

"Cost Less Per Year"

NEW 1200-Ft. Overpass Rests on MONOTUBES

This 1200-ft. overpass is part of a recently completed $310,000 grade separation project which carries traffic over seven busy tracks of the L. & N. Railroad at Louisville, Ky. All pillars and retaining walls rest securely on foundations supported by Monotube cast-in-place concrete piles.

Here, as on scores of other important jobs, Monotubes were selected for their ability to speed installation. Light weight permits these tapered steel casings to be handled quickly. They drive faster because no core or mandrel is required and can be installed with any crawler crane equipped with standard leads and hammer. The casings are readily extended to any length on the job and can be inspected thoroughly prior to concreting.

Union Metal engineers are available for consultation on all piling problems. Write for Catalog No. 68A.

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

Engineers
Kentucky Department of Highways

Contractors
Ruby Lumber Company Madisonville, Ky.

with Mall TRADE MARK **OFF-THE-TRACK POWER UNIT**

- Drives 9 interchangeable tools for Rail Grinding, Circular or Chain Sawing, Wire Brushing, Sharpening Tools, Drilling, Sanding, Pumping, Concrete Vibrating, Concrete Surfacing.
- Tools can be changed in a jiffy
- Easily wheeled by one man
- Variable speed gasoline engine
- Operates on very little fuel
- Insulated flexible shaft protects signals

Write TODAY for literature and ask for a FREE Demonstration.

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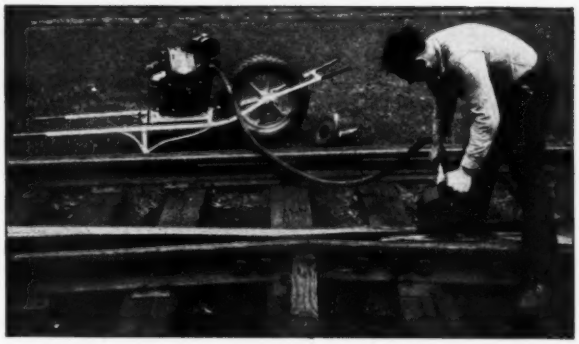
SALES OFFICES IN PRINCIPAL CITIES

GUARD THE RAILS TO GUARD AMERICA

Keeping rail in condition—guarding against the progressive deterioration due to battered ends; to corrugation; worn frogs, switches and crossings—that's the job on which R-T Track Grinders have proved their efficiency.

There's a model for every rail grinding job.
Write for a set of latest Data Bulletins.

See N.R.A.A. Exhibit Space 63, Palmer House, Chicago, March 16-19.



Model P-22 Railway Track-work Grinder—one of many models.

Railway Track-work Co.
3132-48 East Thompson St., Philadelphia

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4th EDITION

STRING LINING OF CURVES MADE EASY

By CHARLES H. BARTLETT

To meet the continuing demands for this booklet, reprinting a series of articles published originally in Railway Engineering and Maintenance, a fourth edition has just been printed and is now available.
Written to meet today's exacting standards for curve maintenance, this booklet presents in detail a method of proven practicability for checking and correcting curve alinement readily with tools that are at hand. It makes possible the accurate realinement of curves without engineering instruments or other appliances than a string and a rule.
Three editions of this booklet, each of 1,000 copies, have already been purchased by track men. Send for your copy of this practical aid for track maintenance.

FIFTY CENTS A COPY

RAILWAY ENGINEERING AND MAINTENANCE
105 W. Adams Street Chicago, Ill.

BLOXHAM—"Best by Test"

WHY **it is greatly preferred by the man on the job**

Because, instead of a back breaking *lift* it is an easy *pull*. In competitive trials it does the work in less time.
Once in position it completes the job without "heeling up" a second time.
Guaranteed unconditionally against breakage or failure.
Let us send you the record of tests without cost or obligation.

CHICAGO STEEL FOUNDRY CO.
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LUFKIN "RANGER" CHROME CLAD
ENGINEER'S TAPE

Engineers who like a durable, compact, easily read steel tape take special note of the Lufkin "Ranger." Its sturdy, flexible steel line is ¼" wide with jet back markings that stand out prominently against the smooth, satin chrome surface. Graduations in feet, tenths and hundredths—or feet, inches and eighths. See it at your dealer's and write for free Catalog 12.

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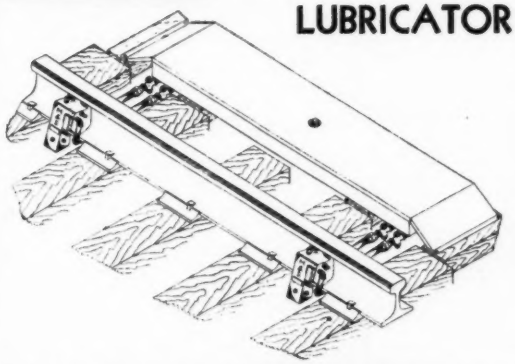

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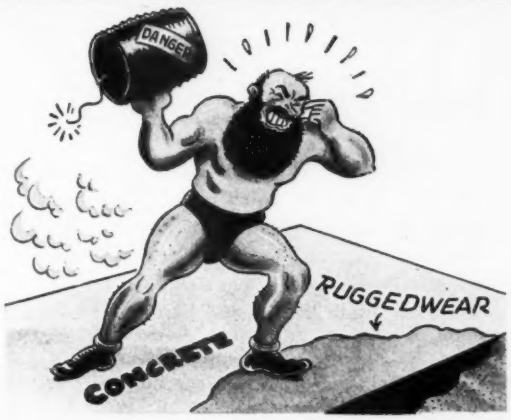

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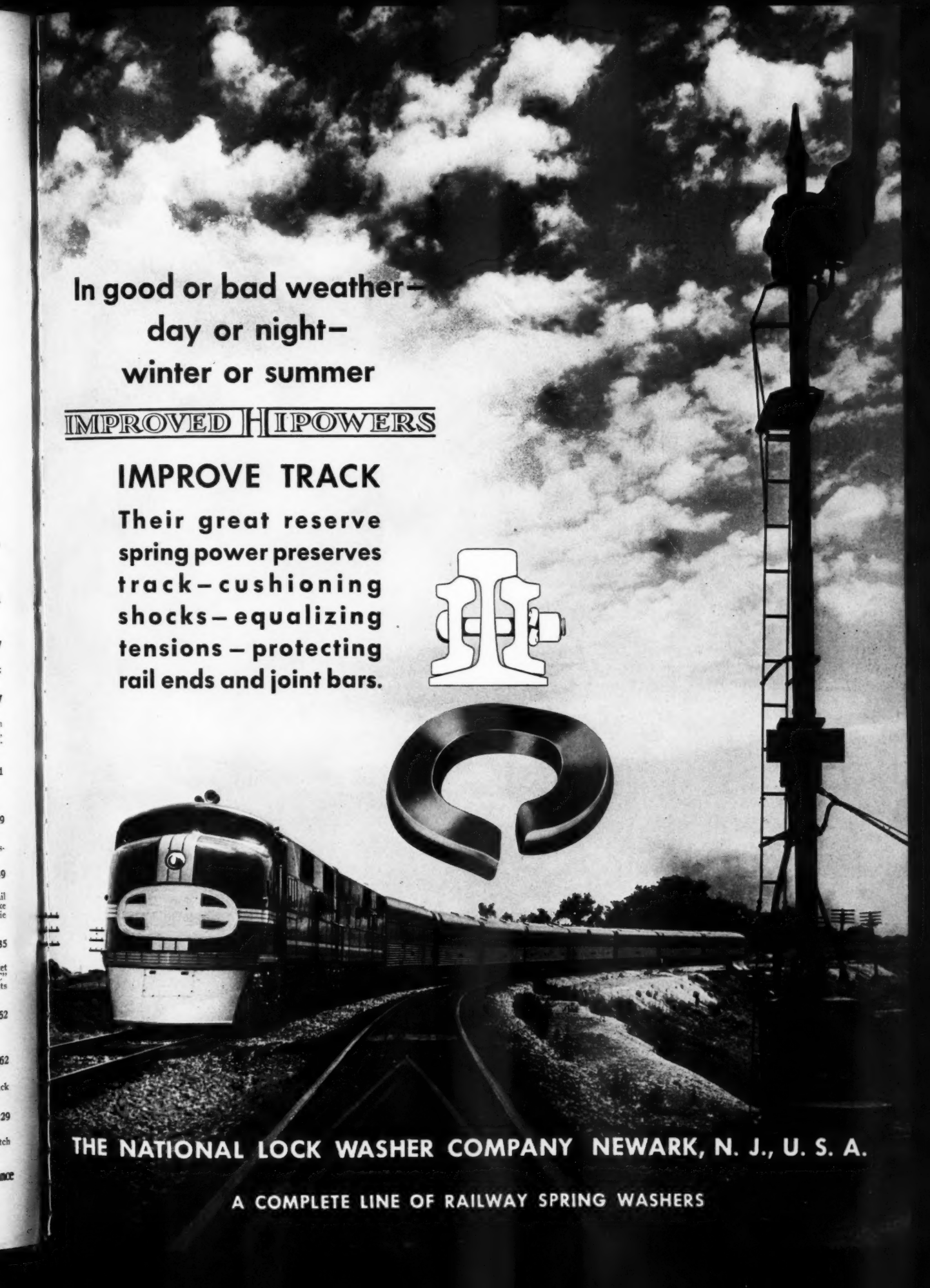
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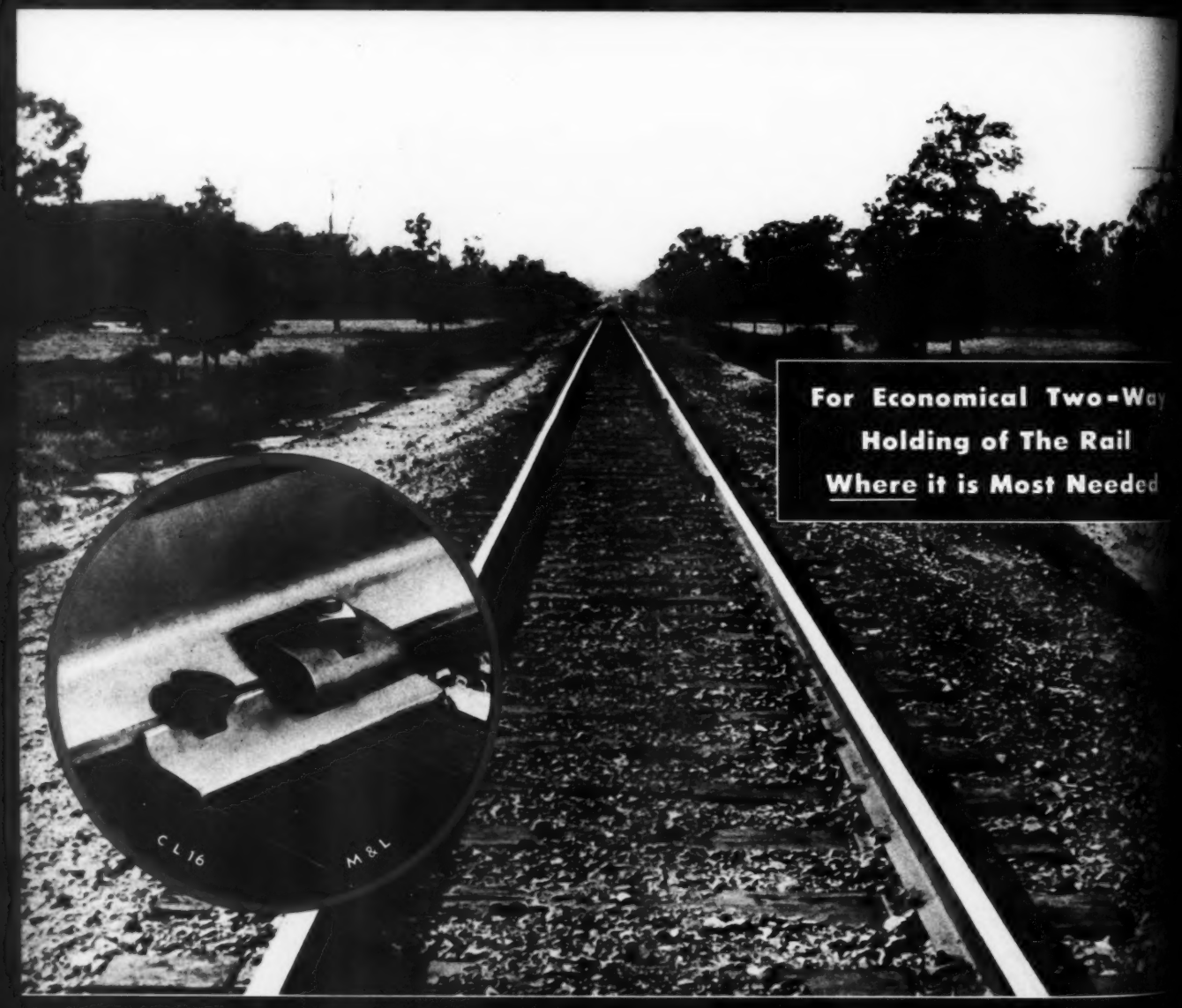

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